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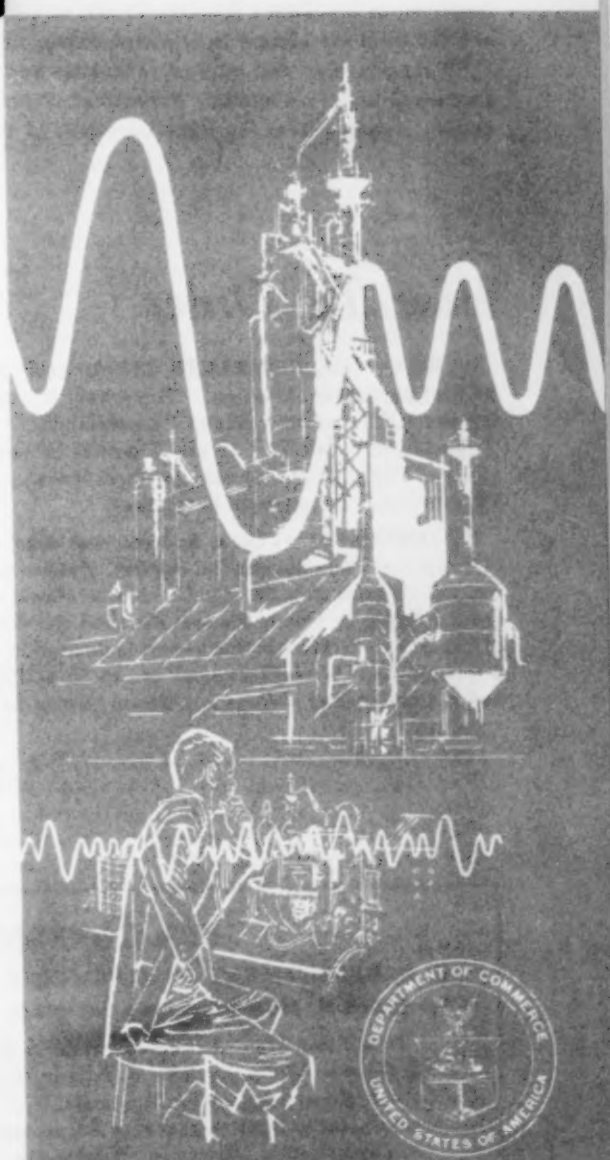

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Report of NRL progress. July 59. (PB 151 340) $1.25, $10.00/yr. 267

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U. S. Government RESEARCH REPORTS

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AGRICULTURE

Plant Cultivation

Harvard Black Rock Forest, Cornwall-on-the-Hudson, N. Y.
MICROCLIMATIC AND VEGETATIONAL STUDIES IN A COLD-WET DECIDUOUS FOREST, by Philip Ross. Rept. on Contract DA 19-129-qm-572. 1958, 97p. 43 refs. Black Rock Forest Papers no. 24.
Order from LC mi$5.40, ph$15.30 PB 140 305

The Harvard Black Rock Forest, situated in Orange County, New York, on the north side of the Hudson Highlands, presents an ideal situation for studying vegetational composition and structure and microclimatic factors. During a period of sixteen months data on temperature and its vertical stratification, relative humidity, precipitation, soil moisture, and soil temperature were gathered from ten field stations and related to topography, soil, and vegetation. Six plant associations were studied and mapped: mixed hardwood, hemlock-hardwood, Quercus rubra, Quercus Prinus, Quercus ilicifolia, and Quercus alba-Carya glabra. Partial solutions for the causes of the distribution of the vegetation types are suggested.

Laboratory of Algal Physiology, U. of Texas, Austin.
STUDY OF A PHOTOSYNTHETIC GAS EXCHANGER AS A METHOD OF PROVIDING FOR THE RESPIRATORY REQUIREMENTS OF THE HUMAN IN A SEALED CABIN, by Jack Myers. Nov 58, 18p. 10 refs. AFSAM 58-117.
Order from LC mi$2.40, ph$3.30 PB 140 218

Design and construction of a model photosynthetic gas exchanger utilizing Chlorella pyrenoidosa grown at 25°C. is described. The system can be operated continuously for periods of 5 to 10 days. Thermodynamic efficiencies of 17 to 18 percent can be achieved and maintained by this system. Practical efficiency is not significantly affected by variation of incident light intensity at levels below light saturation and only slightly affected by variation in the wavelength of illumination in the visible range. The use of urea rather than nitrate as a source of nitrogen for the algae results in more favorable practical efficiency and in an assimilatory quotient $\frac{CO_2 \text{ taken up}}{O_2 \text{ evolved}}$ more nearly in balance with the nominal respiratory requirements of man.

ASTRONOMY

Astrophysics

Air Force Cambridge Research Center, Bedford, Mass.
THE TEMPERATURE OF AN OBJECT ABOVE THE EARTH'S ATMOSPHERE, by Marden H. Seavey. Mar 59, 20p. 2 refs. GRD Research Notes no. 5; AFCRC-TN-58-633; AD-208 863.
Order from OTS $0.50 PB 151 761

The equilibrium temperature of an object above the earth's atmosphere is calculated by considering the thermal radiation balance for the object. Object parameters such as height above earth, shape, thermal conductivity, heat capacity, and surface absorptivity are treated; and it is shown that the latter is the most sensitive parameter in the temperature determination. Temperatures in the neighborhood of 300°K are predicted for gray bodies, but a range of 100°K below or above this temperature may be covered by varying the surface absorptivity characteristics.

Harvard Coll. Observatory [Cambridge, Mass.]
CLASSIFICATION OF SOLAR PROMINENCES. VI. 1948, by Donald H. Menzel and F. Shirley Jones. Scientific rept. no. 11 on Contract AF 19(604)1394. [1958] 50p. AFCRC TN-58-496.
Order from LC mi$3.30, ph$7.80 PB 136 881

This paper presents a tabulation and analysis of the behavior classification of prominences observed at the High Altitude Observatory, Climax, Colorado, for the year 1948, according to the scheme devised by Menzel and Evans (1953) and revised by Menzel and Jones (1956).

Harvard Coll. Observatory, Cambridge, Mass.
RESULTS OF STATISTICAL ANALYSIS OF PHOTOGRAPHIC METEORS REDUCED BY A RAPID GRAPHICAL METHOD. Scientific rept. no. 1 of The Meteor-Ballistic Program, Contract Nonr-1866(05). June 58, 16p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 140 209

The total of 2538 reduced meteors were analyzed for three purposes: the identification of meteoric streams, the derivation of physical quantities relevant to the meteors themselves, and the accumulation of statistics concerning the orbits of sporadic meteors.

High Altitude Observatory, Boulder, Colo.
MEASURES OF IONOSPHERIC ABSORPTION AND REFRACTION AT 18 MEGACYCLES SECOND, by James W. Warwick. Final rept. on AF 19(604)1491. 15 Dec 58, 10p. 22 refs. AFCRC-TR-58-182; AD-160 833.
Order from LC mi$1.80, ph$1.80 PB 140 411

The objective of this contract was the measurement of ionospheric absorption and refraction, at a frequency of 18 Mc./s., by means of the techniques of radio astronomy. Two experiment techniques have been developed: fixed vertical beam measures from an antenna directed towards the zenith with a beam width of about 90^{0}; and measures of the bright radio stars Cassiopeia A and Cygnus A. The latter phase of the project has involved construction of two large, steerable, corner-reflectors in an interferometer system. Measures of absorption by the vertical beam apparatus have permitted a number of conclusions on the course of ionizing flux in the solar flares. In addition, measures of the daily variation in received flux have permitted some conclusions about the structure of the ionosphere in the D-region.

Maryland U., College Park.
SOME ASPECTS OF A THREE-BODY PROBLEM, by Goetz K. Oertel and S. F. Singer. Rept. on Contract AF 49(683)530. Mar 59, 25p. 6 refs. AFOSR TN 59-405; AD-214 502.
Order from LC mi$2.70, ph$4.80 PB 140 501

We treat here a special case of the restricted three-body problem of celestial mechanics, namely the motion of a particle in the field of two non-rotating mass centers whose separation remains fixed. Applying a formalism developed by Charlier we derive limits for the motion of this small mass and give, in particular, the equations for the ellipses in terms of the constants of motion. Especially simple expressions have been derived for a particular choice of initial conditions.

Minnesota U., Minneapolis.
TRANSISTORIZED BALLOON-BORNE COSMIC RAY EQUIPMENT FOR THE I. G. Y., by L. E. Peterson, R. L. Howard, and J. R. Winckler. Technical rept. by Cosmic Ray Group on Contract Nonr-710(19). June 58, 26p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 140 475

Equipment is described which is used to monitor cosmic ray intensities on high altitude plastic balloons. Complete recording and telemetering facilities for up to 30 hours are provided. Transistorized circuits are used throughout, except for R. F. transmitters. Environmental conditioning and auxiliary balloon equipment is described.

BEHAVIORAL SCIENCES

Human Engineering

Antioch Coll., Yellow Springs, Ohio.
EXPERIMENTS ON VIGILANCE: DURATION OF VIGIL AND THE DECREMENT FUNCTION (FOURTH IN A SERIES) by Harry J. Jerison. Rept. on Contract AF 33(616)3404. Dec 58, 19p. 5 refs. WADC Technical rept. 58-369; AD-155 772.
Order from OTS $0.50 PB 151 779

Results of previous experiments on vigilance were reanalyzed for data on human performance during short (half-hour) and long (two-hour) vigils. The analysis indicated that length of vigil did not affect either the initial or terminal level of performance. However, the decrement in performance which begins immediately after the start of a long vigil was delayed in the short vigil. This change in the shape of the decrement function was attributed to different expectations by the subjects about the duration of the vigil, and is consistent with an expectancy theory of vigilance. These results support recommendations that monitoring tasks should be kept short if optimal performance is required.

Army Ordnance Human Engineering Lab., Aberdeen Proving Ground, Md.
INDICATING (READ-OUT) TUBE: HUMAN ENGINEERING APPLICATIONS FOR INFORMAL DISPLAYS, by Charles S. Cruse. Aug 58, 7p. Technical memo. 9-58.
Order from LC mi$1.80, ph$1.80 PB 136 036

The purpose of this paper is to point out some of the advantages that might be gained by the incorporation of "readout" tubes in Ordnance weapons systems. While such devices have been used in the past, the increased complexity of modern equipment, together with the associated human factors problems, justifies new emphasis on the use of such tubes. Those applications discussed constitute only a small fraction of the many possibilities but may be considered representative of such uses.

Army Ordnance Human Engineering Lab., Aberdeen Proving Ground, Md.
INVESTIGATION OF NATURAL MOVEMENTS IN AZIMUTH AND ELEVATION LEVER CONTROL ADJUSTMENTS FOR HORIZONTAL AND VERTICAL POSITIONS, by Richard G. Lazar and James R. Williams. Apr 59, 23p. 28 refs. Technical memo no. 3-59.
Order from LC mi$2.70, ph$4.80 PB 140 666

This study was designed to: (1) Determine population stereotypes or "natural" movements involved in the operation of levers designed to control Elevation and Azimuth movements. (2) Determine in which plane levers should be placed to better effect control; i. e., the HORIZONTAL or the VERTICAL plane. The results indicated that there is a consistent relationship between RIGHT and LEFT control movements and RIGHT and LEFT movements of a display in both the HORIZONTAL and VERTICAL positions. The major finding was that there is no such consistency or "natural" movement or population stereotype with vertically positioned lever controls which move FORWARD and BACKWARD when these controls are associated with an UP and DOWN display movement. The HORIZONTAL control position was found to be more conducive to better performance although the VERTICAL control position was preferred by most subjects.

Navy Electronics Lab., San Diego, Calif.
FOUNDATIONS OF BIOELECTRONICS FOR HUMAN ENGINEERING, by A. Ford. Research rept. for Aug 55 to June 56. 4 Apr 57. [121]p. 614 refs. NEL/Rept. 761; AD-145 734.
Order from OTS $2.75 PB 151 291

Bioelectronics represents a union of electronics with physiology and psychology, for the purpose of measuring the electrical changes associated with the bodily functions of human beings. A survey was made of 615 studies in bioelectronics, from the point of view of application of bioelectrical techniques to human engineering.

Quartermaster Research and Engineering [Center] Natick, Mass.
ARMY HUMAN FACTORS ENGINEERING CONFERENCE. Annual Conference no. 3, 2-4 Oct 57. 28 Oct 57, 111p.
Order from LC mi$6.00, ph$18.30 PB 139 937

Personnel and Training

Adjutant General's Office, Washington, D. C.
EVALUATION OF EST FOR PREDICTING AFQT PERFORMANCE, by Abram G. Bayroff, James A. Thomas, and Carol J. Kehr. Feb 59, 21p. 2 refs. PRB Technical research rept. 1114.
Order from LC mi$2.70, ph$4.80 PB 140 327

EST scores were found to correspond to AFQT scores sufficiently well to justify continued use of EST in screening out likely enlistment failures. However, present practice of using "normative-equivalent" cutting scores on EST, i. e., those matched on a percentile basis with AFQT prerequisites for varying enlistment conditions, did not appear as sound as the use of "predictive" cutting scores based upon validity information and probability limits of success and failure specified by personnel management.

Adjutant General's Office, Washington, D. C.
IDENTIFYING FIGHTERS FOR COMBAT, by Louis P. Willemin, John R. Mellinger, and E. Kenneth Karcher, Jr. Aug 58, 29p. 7 refs. PRB Technical research rept. 1112.
Order from LC mi$2.70, ph$4.80 PB 140 326

Use of combat Aptitude Areas IN and AE (developed from extensive previous research) in place of the existing Aptitude Areas Combat-A and Combat-B would provide, in an Army of one million enlisted men, more than enough men to fill the combat MOS requirements of an entire Pentomic division, while calibre of men available for noncombat branches would also improve slightly.

American Inst. for Research, Pittsburgh, Pa.
AGE AND BEHAVIOR: A STUDY OF THE EFFECTS OF AGING ON AIRCREW PERFORMANCE, by Beatrice M. Shriver. Feb 53, 88p. AFSAM Proj. no. 21-0202-0005, rept. no. 3.
Order from LC mi$4.80, ph$13.80 PB 140 708

The Critical Incident Technique was used to collect reports by aircrewmen on the effects of aging which they had observed in their own performance and in performance and in performance of other active flying personnel. The data indicate that impairment associated with age occurs in the following areas: (1) physical abilities, particularly the ability to resist fatigue and excessive demands upon the organism; (2) ability and motivation to improve in skill and technique; (3) actual job performance particularly with respect to speed and accuracy of work, retention of control in emergency situations, and retention of a proportionate degree of caution; (4) relationships with co-workers; and (5) motivation and adjustment with respect to the job.

Educational Testing Service, Princeton, N. J.
BASIC RESEARCH ON SELECTION AND CLASSIFICATION PROBLEMS, by John W. French. Annual summary rept. on Contract Nonr-2214(00). 15 Nov 57, 7p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 136 700

Learning ability and basic psychometric problems (including test development) were investigated as they relate to the over-all field of selection and classification of personnel. Progress is reported for the following projects: (1) success of instruction as a function of homogeneity among learners; (2) inferring true scores from observed scores; and (3) a search for moderator variables in comparative prediction data.

Harvard Graduate School of Education, Cambridge, Mass.
JOINT-PROBABILITY OF MEMBERSHIP AND SUCCESS IN A GROUP: AN INDEX WHICH COMBINES THE INFORMATION FROM DISCRIMINANT AND REGRESSION ANALYSES AS APPLIED TO THE GUIDANCE PROBLEM, by Maurice M. Tatsuoka (U. of Hawaii). Rept. no. 6 on Harvard Studies in Career Development, Technical rept. no. 2 on Contract Nonr-1866(31); Continuation of Contract N5ori-07669. Aug 57, 125p. 24 refs.
Order from LC mi$6.30, ph$19.80 PB 136 561

There are at least two distinct types of information that are pertinent to the educational or vocational guidance situation. One relates to the question, what are the chances that a given individual will "succeed" in this or that group (curricular or vocational, as the case may be)? The other pertains to the question, how closely does he resemble the successful members of this group or that? In Part I the theoretical basis of the proposed method is presented. In Part II is described an illustrative application of the model to actual data of the sort one would have in the practical educational guidance situation. The report concludes with an examination of the nature of the discriminant that was found, and of the difference in ability-level between the normative and the check sample.

Naval Personnel Research Field Activity, San Diego, Calif.
DEVELOPMENT AND STANDARDIZATION OF THE U. S. NAVY BASIC TEST BATTERY, FORM 6. Nov 58, 13p. 3 refs. BuPers Research rept. 58-2; NAVPERS-18582.
Order from LC mi$2.40, ph$3.30 PB 140 271

This report summarizes the development of the General Classification Test (GCT), Arithmetic Test (ARI), and Mechanical Test (MECH) for Form 6 of the U. S. Navy Basic Test Battery (BTB) for enlisted men. This new form was developed to improve the quality of the battery and to minimize possible loss in test effectiveness due to compromise.

Naval Personnel Research Field Activity, Washington, D. C.
THE DEVELOPMENT OF A NON-COGNITIVE BATTERY TO PREDICT ENLISTED PERFORMANCE, by David Kipnis and Albert S. Glickman. Aug 58, 31p. 15 refs. BuPers Technical Bulletin 58-9.
Order from LC mi$3.00, ph$6.30 PB 140 303

Six experimental tests were developed based upon assumptions concerning characteristics of enlisted men considered by supervisors when judging performance. Following preliminary developmental work, the tests were administered to a sample of 125 third class Aviation Machinist Mates (AD3s). Evaluations of performance were obtained by unofficial evaluations of performance made by each AD3s leading petty officer. For purposes of analysis, two sub-samples (A and B) were formed from the total number of AD3s. Product-moment intercorrelations of predictors, and biserial correlations of each predictor with the criterion, were computed. The results are sufficiently encouraging to warrant further follow-up studies.

Naval Personnel Research Field Activity, Washington, D. C.
VALIDATION OF OFFICER CANIDATE CLASSIFICATION PROCEDURES, by Rosemary Cliff. Feb 58, 24p. 1 ref. Bu Pers Technical Bulletin 58-13.
Order from LC mi$2.70, ph$4.80 PB 140 214

In this study estimates were made of the validity of the Officer Classification Battery (OCB) and Officer Candidate School (OCS) course grades as predictors of academic performance of OCS graduates at the Communication, Combat Information Center (CIC), Aerology and Electronics schools. A good estimate of an OCS graduate's future academic performance at the Communication, CIC, Aerology or Electronics school can be made if it is based on his performance in at least one of his OCS courses. Although knowledge of his scores on the OCB adds little to the accuracy of this estimate, the OCB is independently valid.

Naval Personnel Research Field Activity, Washington, D. C.
VALIDATION OF SELECTION PROCEDURES IN ENLISTED-TO-OFFICER PROGRAMS, by Rosemary Cliff. May 58, 23p. BuPers Technical Bulletin 58-11.
Order from LC mi$2.70, ph$4.80 PB 140 213

Interview ratings and final grade at Officer Candidate School were obtained for the applicants selected for the Integration program. Variance-covariance matrices were computed and corrections made for restriction in the range of criterion and predictor scores. Beta weights and multiple correlation coefficients were derived for several combinations of predictors.

Personnel Lab., Lackland AFB, Tex.
VALIDITY OF THE AFOQT (FORM A) FOR PREDICTION OF STUDENT-OFFICER SUCCESS IN OBSERVER TRAINING, by Lonnie D. Valentine, Jr. Dec 58, 8p. 1 ref. WADC-TN-58-69; AD-207 334.
Order from LC mi$1.80, ph$1.80 PB 140 710

The Air Force Officer Qualifying Test, Form A, was administered to AFROTC sophomores by the AFROTC detachments. Later the answer sheets were rescored at Personnel Laboratory. During the latter half of 1957 criterion data matured on those examinees who had entered Observer Training after completion of the AFROTC program. The aptitude composites and subtests of the AFOQT were validated against three criteria of success in Observer Training using the scores derived from the rescoring. It was found that the Observer-Technical composite is a valid predictor of success in Observer Training for this population. This Note reports the first Observer validities to become available for an AFROTC population.

Psychological Research Associates, Washington, D. C.
THE DEVELOPMENT OF EXPERIMENTAL STRESS-SENSITIVE TESTS FOR PREDICTING PERFORMANCE IN MILITARY TASKS, by James G. Miller. Rept. on Contract DA 49-083-OSA-611. Oct 53, 66p. PRB Technical research rept. 1079.
Order from LC mi$3.90, ph$10.80 PB 140 686

The objective was to find out if certain available tests were able to distinguish a man's reactions under stress conditions as opposed to his reactions in a normal situation. Analysis of the data from the pretests suggested that four of the tests might produce the desired measures: Critical Flicker Fusion at dim

intensity, the Trembleometer, Cancellation of' C's, and the Primary Mental Abilities Word Fluency Test. These four tests were given to 500 pre-inductees under ordinary testing conditions and also under stress conditions and also under stress conditions induced by continuously sounding an 8000-cycle, 90-decibel noise while the men were taking the tests. The results of these trials were not conclusive; however, the Trembleometer and the Critical Flicker Fusion tests appeared to warrant further study.

Psychology—Space Perception

Aero Medical Lab., Wright-Air Development Center, Wright-Patterson AFB, Ohio.
LUMINANCE AND "EXPECTANCY" AS DETERMINANTS OF RESPONSE TIME TO A LIGHT SIGNAL, by James M. Vanderplas, Anthony Debons, and Clarke W. Crannell (Miami U.). Rept. on Criteria for the Design and Arrangement of Displays, Contract AF 33(616)2844. Jan 59, 15p. WADC Technical note 58-292; AD-209 390.
Order from OTS $0.50 PB 151 776

This report describes an experimental evaluation of two factors affecting the speed with which human operators respond to a warning light. The two factors studied were the intensity of the light signal, and the delay interval between an auditory alerting signal and the light signal. Four levels of intensity of the signal light and seven variations from a standard ten-second delay between the auditory signal and the light signal were used. Speed of response was found to be related positively to the intensity or the signal light and to be affected by deviations from the expected standard ten-second delay.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
TASK CLASSIFICATION: AN APPROACH TO PARTIALLY ORDERING INFORMATION ON HUMAN LEARNING, by Theodore E. Cotterman. Rept. on Psychological Research on Human Performance. Jan 59, 20p. 3 refs. WADC Technical note 58-374; AD-210 716.
Order from OTS $0.50 PB 151 772

It is proposed that a task classification scheme(s) be developed in terms of which it is possible to sort all human learning tasks. Each task category would be set up in such a way that a specified set of common principles of learning referring to basic variables would operate in essentially the same way in all task situations subsumed under it. In this way the actual and hypothesized effects of various basic and task variables and their interactions would be set forth. Task categories seem best defined in terms of general physical language with particular attention to the nature of the transformation of stimulus into response events rather than in terms of inferred behavioral processes. Task classification would serve the general purpose of making information on human learning more usable and also result in a number of specific advantages both for research and application purposes.

Aviation Psychology Lab., Ohio State U. Research Foundation, Columbus.
EFFECTS OF SCALE SHAPE, EXPOSURE TIME, AND DISPLAY-RESPONSE COMPLEXITY ON SCALE READING EFFICIENCY, by Edwin H. Elkin. Rept. on Contract AF 33(616)3612. Feb 59, 19p. 13 refs. WADC Technical rept. 58-472; AD-209 381.
Order from OTS $0.50 PB 151 781

Three scale-reading variables (scale shape, exposure time, and degree of display-response complexity) were examined in both quantitative and qualitative reading tasks. The scales were calibrated to the nearest unit or five units on a 100-unit scale. Speed and accuracy scores were recorded for 48 scale-reading conditions. The results for quantitative reading indicate (a) the order of superiority for speed and accuracy is open-window, circular, and vertical; (b) reducing exposure time leads to more errors and slower reading times; and (c) reducing the number of response categories required increases reading efficiency, the effect on speed being greater than on accuracy. For qualitative reading (a) all scale shapes are equally adequate in terms of accuracy; and (b) the order of superiority in terms of speed is circular, vertical, and open-window. It is concluded that there is no one best scale design to fit all reading requirements.

Human Sciences Research, Inc., Arlington, Va.
CONCEPTUAL FRAMEWORK FOR THE INTEGRATION OF SMALL GROUP RESEARCH INFORMATION, by Irwin Altman and Joseph McGrath. Technical note on Contract AF 49(638)256. Feb 59, 110p. 28 refs. HSR-TN-59/1-GN; AFOSR-TN-59-252; AD-212 252.
Order from LC mi$5.70, ph$18.60 PB 140 706

This is a report of the second phase of a research program designed to integrate existing research knowledge about small groups. It describes the basic approach and resulting integrative framework (Chapters I and II), presents results of its application to a sample of small group research studies (Chapter III), and discusses some major potential applications of the research to basic and operational problem areas (Chapter IV). A coder instruction manual is presented in Appendix 1.

Indiana U., Bloomington.
PATTERN OF SOMATIC RESPONSES DURING A REPETITIVE MOTOR TASK AND ITS MODIFICATION BY VISUAL STIMULI, by R. C. Davis, Arne Lundervold, and James D. Miller. Technical rept. no. 3 on Contract Nonr-908(03). Apr 55, 27p. 13 refs. AD-84 883.
Order from LC mi$2.70, ph$4.80 PB 136 838

By recording nine response variables simultaneously we ascertained the effect of continued paced tapping, maximum rate tapping, the superimposition of visual stimuli on continued tapping, and certain other associated conditions.

Laboratory of Aviation Psychology, Ohio State U., Columbus.
STIMULUS CORRELATES OF VISUAL PATTERNS RECOGNITION: A PROBABILITY APPROACH, by Paul M. Fitts and J. Alfred Leonard. Final rept. on Contract Nonr-495(02). Oct 57, 47p. 19 refs.
Order from LC mi$3.30, ph$7.80 PB 136 744

Contents:
Section I - Theory and methodology for the study of pattern perception
Section II - Experimental findings
Section III - Implications

Laboratory of Social Relations, Harvard U., Cambridge, Mass.
DIFFERENTIATION OF SOCIOMETRIC CHOICE AND ITS IMPLICATIONS FOR STATUS RELATIONS IN A GROUP, by Renato Tagiuri, Nathan Kogan, and Lewis M. K. Long (U. of Arkansas Medical Center). [Rept. on Contract N5ori-07670] 1 Sep 57, 8p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 136 061

The present paper (will) examines the distinction among choices made possible by the introduction of the perceptual dimension into the sociometric procedure.

Louisiana State U., Baton Rouge.
SOME EFFECTS OF DECISION AND DISCUSSION ON COALESCENCE, CHANGE AND EFFECTIVENESS, by D. F. Pennington, Jr., Francois Haravey, and Bernard M. Bass. Technical rept. 14 on Behavior in Groups, Contract N7onr-356(09). Oct 57, 15p. 15 refs.
Order from LC mi$2.40, ph$3.30 PB 136 886

Three hypotheses were tested: 1. Group discussion promotes coalescence (or increased agreement), effectiveness, and change. 2. Group decision, per se, does likewise. 3. A combination of discussion and decision yields the greatest amount of coalesence-effectiveness and change. The absence of both discussion and decision produces the least coalescence, effectiveness and change. There were 4 treatments. Five groups only discussed the rankings, 5 groups reached decisions without discussion, 5 groups did both while 5 others did neither.

Maryland U., College Park.
CLUSTERING OF NOUNS THROUGH MEDIATION BY ADJECTIVE CATEGORIES, by Richard C. Gonzalez and Charles N. Cofer. Technical rept. no. 17 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). Aug 57, 6p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 136 064

Maryland U., College Park.
AN EXPLORATORY COMPARISON OF THE EFFECTS OF VARIOUS TYPES OF CONCEPTUAL ARRANGEMENTS ON THE LEARNING, RETENTION, AND RECALL OF NONSENSE WORDS, by Richard H. Page. Technical rept. no. 20 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). July 58, 12p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 140 472

The individual variability in performance was so high and the N so small, that it has been decided merely to present a table of the raw scores obtained and to limit analysis to inspection of these data and to a few rank order correlational approaches.

Maryland U., College Park.
FURTHER STUDY OF THE EFFECT OF INAPPROPRIATE ADJECTIVES ON CLUSTERING IN FREE RECALL, by Richard C. Gonzalez and Charles N. Cofer. Technical rept. no. 18 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). Aug 57, 4p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 136 063

Maryland U., College Park.
RETROACTIVE INTERFERENCE IN MEANINGFUL MATERIAL AS A FUNCTION OF THE DEGREE OF CONTEXTUAL CONSTRAINT IN THE ORIGINAL AND INTERPOLATED LEARNING, by David J. King and Charles N. Cofer. Technical rept. no. 21 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). July 58, 20p. 21 refs.
Order from LC mi$2.40, ph$3.30 PB 140 473

The present research utilizing a retroactive interference design was concerned with first, the demonstration of retroactive interference in connected meaningful material and second, in observing how retroactive interference, if any, varies with differing degrees of connectedness or contextual constraint in the original and interpolated learning.

Michigan U., Ann Arbor.
GENERALIZATION OF ATTITUDE CHANGE WITHIN AN OPPOSITES STRUCTURE II, by Helen Peak, Margaret Clay and others. Technical rept. 4 on Contract Nonr-1224(10). 15 June 58, 33p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 139 872

The principal hypothesis being tested is that changing attitude toward one member of an opposites pair will produce change in the opposite direction for the other member of the pair.

Radiobiological Lab., U. of Texas, Austin.
PERIPHERAL CUE LEARNING SET IN RHESUS MONKEYS, by A. A. McDowell and W. Lynn Brown. Feb 59, 4p. 2 refs. AFSAM rept. 59-4.
Order from LC mi$1.80, ph$1.80 PB 140 667

Four control and nine chronic whole-body irradiated rhesus monkeys, with previous experience on standardized learning set problems and in the utilization of peripheral cues to procure food rewards, were tested on six four-trial peripheral cue learning set problems per day for 39 days. The results of the experiment were that: (1) The irradiated Ss did not differ significantly from the control Ss with respect to performance on this training. (2) There was no significant inter-

problem improvement in performance over the periods of testing. (3) There was statistically significant intraproblem improvement in the performance which was consistent over the periods of testing.

Research Center for Human Relations, New York U., N. Y.
GROUP EFFECTS ON TENSION PATTERNS AND MOTIVATION, by Murray Horwitz. Annual rept. to 15 Nov 57 on Contract Nonr-285(28). [1957] 16p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 137 858

Progress report dealing primarily with Lewin's treatment of tension systems.

Syracuse U., N. Y.
SUSCEPTIBILITY TO PRESSURES TOWARD UNIFORMITY OF BEHAVIOR IN SOCIAL SITUATIONS: A STUDY OF TASK, MOTIVATIONAL AND PERSONAL FACTORS IN CONFORMITY BEHAVIOR, by Francis J. Di Vesta. Rept. on Contract AF 18(603)20. June 58, 82p. 93 refs. AFOSR TR-58-70; AD-158 291.
Order from LC mi$4.80, ph$13.80 PB 140 461

Vanderbilt U., Nashville, Tenn.
STUDIES IN TRANSFER LEARNING: EFFECT OF METHODS OF INSTRUCTION ON OPERATOR PROFICIENCY, by Clarence Cyr, Leland E. Thune, and Stanford C. Ericksen. Technical rept. no. 1 on Contract Nonr-2149(01). Nov 57, 38p. 34 refs.
Order from LC mi$3.00, ph$6.30 PB 136 701

The relative effectiveness of two contrasted methods of instruction on the learning, retention, and transfer of complex operator skills. The two training methods represent forms of self study exercises and can be characterized as Rote (concrete or perceptual learning) and Concept (learning of principles and generalizations). There is also evidence that the learning of concepts and general principles may likewise produce positive transfer, and these findings support the educational emphasis that has been centered on the teaching of principles in addition to using rote drill and exercise.

Washington U., Seattle.
EVOLUTION OF INTELLIGENCE. THE NERVOUS SYSTEM AS A MODEL OF ITS ENVIRONMENT, by H. J. Bremermann. Technical rept. no. 1 on Contract Nonr-477(17). July 58, 106p. 28 refs.
Order from LC mi$5.70, ph$16.80 PB 140 434

The report deals with the problem from a broad point of view (necessitated by the broadness of the brain's performance). It is shown that the principle of evolution that explains the gradual development of higher forms of life from primitive beginnings can be applied to the brain and is most useful as a key to the understanding of creative thinking and learning. The report touches on a variety of subjects as biology, information theory, neuro-anatomy and neurophysiology, mathematics, symbolic logic, and linguistics, but it should be readable without specialized knowledge in these fields.

American Museum of Natural History, New York.
ANALYSIS OF SOUND PRODUCTION IN THE GOBIID FISH, BATHYGOBIUS SOPORATOR AND IN RELATED SPECIES, by William N. Tavolga. Annual progress rept. for 1 Sep 56-31 Aug 57 on Contract Nonr-552(06). 1 Feb 58, 3p.
Order from LC mi$1.80, ph$1.80 PB 140 471

The males of the gobiid fish, Bathygobius soporator, produce low-pitched grunting sounds while courting females. The mechanism of sound production is unknown, but it appears to involve the forcible ejection of water through the gill openings. Playback of recorded sounds to the fish results in positive approach responses from males. Females respond with a general activity increase. Females approach the sound source only if a visual stimulus of a confined goby is also present.

Hugelin, A.
ANALYSIS OF RETICULAR AND CORTICAL POST-DISCHARGES FOLLOWING ELECTRICAL RETICULAR STIMULATION, by A. Hugelin and M. Bonvallet. Rept. on Contract AF 61(514)1100. [1957] 13p. 4 refs. AFOSR TN-58-540; AD-158 356.
Order from LC mi$2.40, ph$3.30 PB 140 329

The present study has been performed on "encéphale isolé" preparations; experimental conditions were described in the preceding article (Hugelin et Bonvallet, 1957a). The monosynaptic excitability of motoneurons of the masseter has been tested during post-discharges evoked by reticular mesencephalic stimulation by placing the test reflex at a variable delay after the end of standard stimulation for each set of experiments.

Syracuse U., N. Y.
NUTRITIVE VALUE OF THE WOOD-ROTTING FUNGI AND THEIR SYNTHETIC PRODUCTS, by M. W. Jennison, Chester Koda, and Maurice Fagan. Semiannual progress rept. no. 2, Jan-June 53, on Contract Nonr-669(06). June 53, 16p. AD-13 909.
Order from LC mi$2.40, ph$3.30 PB 136 169

This investigation involves first a systematic exploratory study of the composition of (1) the fungal mycelium, and (2) the culture fluid, as regards nitrogen compounds, fats, vitamins, etc. synthesized by the wood-rotting fungi in submerged culture.

Anatomy and Physiology

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF PARTIAL SUPINATION COMBINED WITH THE ANTI-G SUIT ON G TOLERANCE IN NAVY PILOTS, by Philip J. Dorman and

Richard W. Lawton. Rept. no. 4 on Proj. NM 001 100 300. 8 May 56, 18p. 10 refs. NADC-MA-5606.
Order from LC mi$2.40, ph$3.30 PB 140 438

A preliminary study of the G protection afforded by the combination of partial supination (65°) and the Navy Z-2 anti-blackout suit is presented. A total of 305 runs on 9 trained centrifuge subjects and 233 runs on 24 Navy pilots were performed. Using grayout (peripheral light loss) as an end point, 66.7 percent of the fleet pilots were able to withstand 7 G for 15 to 30 seconds sitting upright, wearing a standard Navy Z-2 suit inflated to 7-9 p.s.i. pressure. The remainder failed the 7 G, 30-second run. The 65° supine position alone failed to improve the performance of this latter group. All of these subjects were then retested in the 65° supine position wearing an inflated Z-2 suit (7-9 p.s.i. pressure). One hundred percent of subjects thus tested successfully withstood 7 G for 30 seconds, although the unprotected tolerance in some subjects was as low as 2.5 G.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
SOME OBSERVATIONS ON HUMAN TOLERANCE TO EXPOSURE OF 15 TRANSVERSE G, by T. D. Duane, Edward L. Beckman and others. 30 July 53, 31p. 10 refs. NADC-MA-5305; Rept. no. NM 001 060.10.04.
Order from LC mi$3.00, ph$6.30 PB 140 436

Five subjects were exposed to 15 transverse G for five seconds in the supine position. Also, five subjects were placed in the prone position and exposed to the same accelerative conditions. Blackout and unconsciousness did not occur and the physiological effects produced were of a transient nature. An adequately stressed seat was sufficient protection for the supine position. Since the conventional shoulder harness and lap belt were not suitable for levels above 7 G when the stress was applied in the prone position, additional thorax and leg barriers were employed.

Chicago U., Ill.
FACTORS IN VISUAL ACUITY, by Peter H. Greene. Rept. on Application of Information Theory to the Nervous System, Contract AF 18(600)1454. 25 Aug 58, 118p. 29 refs. AFOSR TR-58-85; AD-158 397.
Order from LC mi$6.00, ph$18.30 PB 136 754

An interpretation is suggested for experimental results on the location of perceived contours in studies of Mach bands (sharply defined subjective bands seen in continuous luminance distributions), irradiation (change in apparent width of a bar with changes in luminance), and resolution distance (minimum distance separating two bars which can just be perceived as separate). An experiment based upon analysis of the Mach band experiments supports the view that contour-perception depends upon inhibitory influences between neighboring points in the visual pathway. Analysis of the irradiation experiments shows that the spatial extent of the blurring of the visual image owing to optical and neural effects must be at least twice the amount in the literature for the optical part of the blurring. Experimental results in the literature may be consistently interpreted by the hypothesis that a contour appear at a point where the difference between the local excitation intensity and the average intensity in a neighborhood of the point attains a threshold, or else at the point of maximum slope of the excitation distribution in case the above-mentioned difference nowhere attains its threshold. Resolution is shown to depend upon two factors: intensity discrimination and the response of the inhibitory mechanism. The inhibitory mechanism can allow resolution of two bright bands even when they are so close together that their blurred excitation distribution is unimodal. Experiments are proposed which would test this conclusion.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
THE MECHANICAL POWER OUTPUT OF MEN, by Ezra S. Krendel. Final technical rept. on Contract Nonr-2180(00). Jan 58, 92p. 62 refs. Rept. F-A1982.
Order from LC mi$5.40, ph$15.30 PB 140 339

A scheme for designing man-powered devices for optimal power transfer from the human operator to the mechanism is discussed. Data indicating the feasibility of such a design are presented. Such data as were available for unusually high as well as for average power production in cranking, pedalling, and other tasks are presented in a systematic fashion.

Johns Hopkins Hospital, Baltimore, Md.
MECHANISMS OF AIRWAY OBSTRUCTION, by E. J. M. Campbell, Harry B. Martin, and Richard L. Riley. Feb 59, 13p. 13 refs. AFSAM 58-139.
Order from LC mi$2.40, ph$3.30 PB 140 219

When intrathoracic pressure ($P_T{}^D$) and rate of airflow are simultaneously recorded during a forced expiration, the rate of airflow rises to a maximum value and then decreases while $P_T{}^D$ continues to rise. This observation suggests that there is a maximum effective intrathoracic pressure ($P_T{}^{Max\ Eff}$) associated with a maximum expiratory flow rate ($V_E{}^{Max}$). If $P_T{}^D$ rises above $P_T{}^{Max\ Eff}$ airway resistance increases disproportionately and flow rate decreases. Using esophageal pressure to measure P_T and a pneumotachometer to measure V we determined $P_T{}^{Max\ Eff}$ and $V_E{}^{Max}$ in normal subjects, in patients with diffuse emphysema, and in patients with asthma. In both these diseases $V_E{}^{Max}$ was found to be reduced. $P_T{}^{Max\ Eff}$ was markedly reduced in most of the individuals with emphysema. It was moderately high in those with asthma and very high in the normal people. Nonelastic resistance was also measured during quiet inspiration and found not to be increased in the patients with emphysema to a degree comparable with that found in the patients with asthma. The physical basis of $P_T{}^{Max\ Eff}$ is discussed in terms of a simple mechanical model, and a mathematical analysis is presented which indicates that critical narrowing first occurs in the very small airways in emphysema and in the larger airways in asthma. A plan for distinguishing between different mechanisms of airway obstruction is presented.

Massachusetts Inst. of Tech., Cambridge.
VISCO-ELASTIC LOSSES IN TISSUES IN THE ULTRASONIC RANGE, by T. F. Hueter. Rept. for Apr 55 to May 57 on The Generation, Propagation, Action and Control of Acoustic Energy, Contract AF 33(616)2976. Aug 58 [93]p. 41 refs. WADC Technical Rept. 57-706; AD-142 172.
Order from OTS $2.25 PB 151 275

The propagation of ultrasonic waves is accompanied by a loss of vibrational energy whose frequency dependence is characteristic of the structural properties of the medium. A review of the various loss mechanisms that may occur in animal tissues or in other live colloids reveals that the different organizational levels of these structures-from the protein molecule to the gross-tissue matrix-may contribute to the losses in many different ways. Some of these have been investigated by means of absorption studies in inorganic particle suspensions of various concentrations and degrees of particle interactions. Frequencies ranging from 20 kc to 10 Mc have been used. The equipment used for this purpose is described. A transition of low- to high-frequency absorption indicative of visco-elastic relaxation processes is observed. On the basis of new data, the hypothesis is advanced that low-frequency absorption is due mainly to gross-tissue structure, whereas the seat of high-frequency absorption is mainly in the molecular constituents of the tissues.

Naval Medical Research Inst., Bethesda, Md.
A REVIEW OF SUBJECTIVE RESPONSES TO VIBRATORY MOTION OF THE HUMAN BODY IN THE FREQUENCY RANGE 1 TO 70 CYCLES PER SECOND, by David E. Goldman. Rept. no. 1 on Proj. NM 004 001. 16 Mar 48, 19p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 140 654

Analysis of measurements of several investigators on subjective responses to mechanical vibration shows that these responses may conveniently be referred to three levels: I. the threshold of perception, II, the threshold of discomfort, and III. the threshold of tolerance. The three reference curves so obtained have an uncertainty of about one-half of a log unit. Their shape is referable to frequency characteristics of the body structures and sense organs concerned. With certain limitations, the results are applicable to field conditions.

Quartermaster Research and Engineering Center, Natick, Mass.
THE EFFECT OF A VAPOR BARRIER ON RATES OF EXCRETION OF SWEAT SOLUTES, by David E. Bass, Milton Mager, and Richard B. Barrueto. Mar 59, 14p. 15 refs. Technical rept. EP-103.
Order from LC mi$2.40, ph$3.30 PB 140 690

The effects of a vapor impermeable barrier on rates of excretion of Na, Cl, K, true creatinine, and "apparent" creatinine from the arms of men during thermal sweating were determined by collecting sweat solutes simultaneously from both arms, one of which was enclosed in a polyethylene bag. The separate effects on rates of excretion of the higher local skin temperature (T_S) and higher relative humidity (RH) imposed by a vapor barrier were assessed by means of a thermoregulated arm-chamber. Wearing a vapor barrier resulted in a significantly decreased rate of excretion of K and an increased rate for both true and "apparent" creatinine. The effect on "apparent" creatinine was attributable entirely to the increased excretion of the fraction represented by true creatinine. Rates of excretion of Na and Cl were not significantly affected by the vapor barrier. Increased T_S per se resulted in higher excretion rates of Na, Cl, K, true creatinine, and urea. Increased RH per se led to decreased excretion of Na, Cl, K, and urea, but had no effect on rate of excretion of true creatinine. The observed effect of a vapor barrier on excretion rates of these sweat solutes was therefore the net result of T_S and RH operating in opposite directions; thus, RH was more effective re K, and T_S was more effective re true creatinine. These factors exerted approximately equal and opposite effects on both Na and Cl.

School of Aviation Medicine, Randolph AFB, Tex.
THE CONCEPTS OF WEIGHT AND STRESS IN HUMAN FLIGHT, by Oskar L. Ritter and Siegfried J. Gerathewohl. Jan 59, 11p. 15 refs. Rept. 58-154.
Order from LC mi$2.40, ph$3.30 PB 140 313

The purpose of this discussion is to analyze the usage of terms and expressions, to disentangle their diverse meanings, and to present some of the physical facts together with a simple and consistent set of concepts for their description.

University of Southern Calif. School of Medicine, Los Angeles.
RELATION OF SEVERAL PHYSIOLOGICAL PARAMETERS TO POSITIVE G TOLERANCE, by John P. Meehan and Howard I. Jacobs. Rept. on Biophysics of Acceleration, Contract AF 33(616)2952. Jan 59, 15p. 4 refs. WADC Technical rept. 58-665; AD-209 387.
Order from OTS $0.50 PB 151 785

A series of experiments was undertaken in an attempt to relate several physiologic parameters to positive g tolerance. Blood pressure, blood volume, and physical condition as measured by both the Harvard Step Test and a modified physical fitness test were the parameters studied. Subjects were studied at the end of one month of enforced rest and again at the end of one month of supervised physical training. It can be concluded that considerable change in the physical condition of an individual does not affect his tolerance to positive acceleration.

Biochemistry

Illinois U., Urbana.
STUDIES ON ORGANIC ACID METABOLISM, by I. C. Gunsalus. Annual progress rept. for 1 Jan 54-31 Dec 57 on Contract Nonr-173(00). 16 July 58, 8p. 13 refs.
Order from LC mi$1.80, ph$1.80 PB 140 463

These studies involve a determination of the overall flow patterns of metabolites and of the sequence of steps they undergo in performing their cellular functions.

Institute of Andean Biology, Lima (Peru).
IRON METABOLISM IN THE POLYCYTHEMIA OF HIGH ALTITUDES, by César Reynafarje, Rodolfo Lozano, and José Valdivieso. Sep 58, 21p. 34 refs. AFSAM 58-96.
Order from LC mi$2.70, ph$4.80 PB 140 314

Observations on iron metabolism, related to low oxygen tension at high altitudes, were made in human subjects. These consisted mainly in the study of intestinal absorption and turnover rate of iron, by means of radioactive isotope of this metal (Fe_{59}). Additional observations were made on the blood volume, reticulocytosis, bone marrow cytology, life span of the red cells, and on the hemoglobin breakdown pigments.

General Biology

California U., Berkeley.
ANALYSIS OF SOIL INVERTEBRATE SAMPLES FROM BARROW, ALASKA, by Paul D. Hurd, Jr. and Evert E. Lindquist. Final rept. for 1 Feb 56-1 Feb 57 on Contract Nonr-1138(01). 1 Feb 58, 24p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 140 476

The soil organisms in the 769 Berlese soil samples were separated into major systematic groups. These identifications which cover not only the qualitative phase of this project, but also the total terrestrial arthropod (insects, mites, and spiders) of the near Barrow, Alaska region are presented. Thus for the first time a qualitative analysis of these groups as represented on the most northern fringe of the North American continent has been accomplished.

Cornell U., Ithaca, N. Y.
THE ACOUSTIC RECEPTOR OF SPIDERS, by W. G. Van der Kloot and Charles Walcott. Rept. on Contract Nonr-401(28). 11 June 58, 3p.
Order from LC mi$1.80, ph$1.80 PB 140 467

It seems that the receptor is normally serving the spider as a highly sensitive vibration receptor. The receptor is obviously important in food-catching behavior and also may be important in breeding behavior. Perhaps the response to air-born vibration is a secondary feature; although it is known that many species of spider produce sounds by stridulation and therefore auditory sensitivity may also be important for the life of the spider.

Microbiology

Lovell Chemical Co. [Watertown, Mass.]
DEVELOPMENT OF MOLECULAR FILTERS AND METHODS FOR THEIR PRODUCTION, by John H. Bush. Monthly progress rept. nos. 1-11, and Final, for 1 Oct 50-30 Sep 51. [1951] 109p.
Order from LC mi$5.70, ph$16.80 PB 136 167

Wahl-Henius Inst., Chicago, Ill.
MAINTAINING VIABILITY IN MICROORGANISMS SUBJECTED TO FREEZE DRYING, by Robert I. Tenney. Final rept. for 25 June 53-24 June 54. 21 July 54, declassified, 33p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 136 770

This report is in the nature of an information collation drawing upon the four quarterly reports which have been submitted previously. Its purpose is to tie together the separated topics of earlier reports and to give a general picture of the work. Details have been largely eliminated, but references to their sources in the previous reports are shown. A bibliography is appended as Section VI to give proper credit to references cited from the literature. A major part of this work has been devoted to the menstruum composition as influenced by the Viability Protective Factor. The work done toward defining the effects of such influences as infra-red, age of cells, etc., was undertaken with a primary view to production problems. The results have been helpful in devising short cycle drying operations although some of the conclusions have differed with views previously held at Camp Detrick.

Pathology

Pennsylvania U., Philadelphia.
BIOPHYSICS OF DIATHERMY, by Herman P. Schwan. Chap. in Therapeutic Heat, 1957. Technical rept. no. 21 on Contract Nonr-551(05). Dec 58, 144p. 58 refs.
Order from LC mi$7.20, ph$22.80 PB 140 350

Attempt to outline the principles which determine the transfer of energy of electrical currents, electromagnetic waves and ultrasonic waves in the human body.

School of Aviation Medicine, Randolph AFB, Tex.
DETECTION OF CERTAIN SEROLOGIC IMBALANCES IN HUMAN SERA BY AGAR COLUMN ANALYSES, by William G. Glenn, Arthur H. King, and Iowa W. Marable. Feb 59, 7p. 15 refs. Rept. 59-32.
Order from LC mi$1.80, ph$1.80 PB 140 311

The detection of normal and abnormal human sera by quantitative analyses of agar column diffusion patterns has been confirmed and amplified. Baseline precipitin patterns from 29 sera, assumed to be normal, were compared with diffusion spectra of 131 sera from hospitalized subjects. The same fast-moving faint zone, previously observed and believed to be associated with an increased concentration of mucoprotein, was evident. Diffusion data on this precipitin system, together with the data associated with albumin and globulins, were analyzed in order to detect certain serologic imbalances. These analyses showed serologic imbalances in hospitalized subjects in 36 percent more cases than was shown by the usual clinical C-reactive protein test. The results paralleled the physician's estimate of the stress produced by the particular disease state or condition.

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
DETERMINATION OF PENTABORANE IN AIR, AND THE SYMPTOMS AND TREATMENT OF PENTABORANE POISONING IN ANIMALS, by Jesse H. Weatherby. Feb 58, 13p. CWL Special Pub. 2-5.
Order from LC mi$2.40, ph$3.30 PB 140 310

Mice were exposed to various concentrations of pentaborane in a small gas chamber through which a constant flow of the gas mixture was maintained. At a concentration of 40 p.p.m. the first of six animals died within 16 minutes, and all were dead within 29 minutes. At a concentration of 20 p.p.m. the first of six died within 26 minutes, and all were dead within 50 minutes. At a concentration of 10 p.p.m. the first of six died within 72 minutes, and all were dead within 90 minutes. At a concentration of 5 p.p.m. none died during an exposure of 177 minutes, although two had convulsive seizures; all appeared to be completely recovered within 24 hours. Ten of twelve exposed to 10 p.p.m. for 60 minutes died; the two remaining mice survived and appeared normal during a period of observation of 5 days. This suggests that residual effects need not be anticipated after recovery from the acute effects of a non-fatal exposure.

[Army] Chemical Warfare Labs., Army Chemical Center, Md.
THE MEDIAN LETHAL CONCENTRATION OF DIBORANE VAPOR FOR RATS AND MICE, by Lorraine H. Lawson and Keith H. Jacobson. Technical rept. for 21 Dec 53-5 Apr 54. 3 Mar 56, 9p. 4 refs. Chemical Warfare Labs. rept. no. 2031.
Order from LC mi$1.80, ph$1.80 PB 140 688

Median lethal concentrations for 4-hr. exposures of rodents to diborane were determined to facilitate comparison of the acute toxicities of various boron compounds. These LC50 values were 80 p.p.m. for 5-mo.-old Chemical Warfare Laboratories Colony rats, 40 p.p.m. for 2-mo.-old Edgewood Breeding Farms rats, and 29 p.p.m. for Carworth Farms mice. Evidence from an additional experiment with the two strains of rats suggests that the difference in LC50 values for the rats results in greater measure from the age or weight difference than from the strain difference. Flies were also exposed to diborane, and results from these exposures show that flies are not useful as diborare detectors.

Chemical Corps Medical Labs., Army Chemical Center, Md.
THE ACUTE TOXICITY OF DIMETHYLAMINODIBORANE VAPOR, by Leo Feinsilver, Lorraine H. Lawson and Keith H. Jacobson. May 55, 8p. 4 refs. Medical Labs. research rept. no. 359.
Order from LC mi$1.80, ph$1.80 PB 140 307

Rats and mice exposed to dimethlyaminodiborane (DMADB) vapor for periods of 4 hr. showed increased respiratory rate followed by gasping. Pulmonary edema was found in both species examined immediately after exposure. The LC50 for rats was 86 ppm (248 mg./m.^{3}); the LC50 for mice was 63 ppm (182 mg./m.^{3}).

Chemical Corps Medical Labs., Army Chemical Center, Md.
THE BREAKDOWN OF DECABORANE IN PROTEIN SOLUTIONS, WATER, AND ALCOHOL, by David L. Hill, Edward T. Gipson, and Henry C. Zak. Nov 54, 12p. 2 refs. Medical Labs. research rept. no. 324.
Order from LC mi$2.40, ph$3.30 PB 140 308

Experiments are described in this paper which demonstrate the formation of intermediate substances prior to the formation of borate when decaborane is allowed to react with protein solutions, water, or alcohol. Preliminary examination of these intermediate compounds indicate that they are not nonpolar but contain certain ionizable groupings.

Chemical Corps Medical Labs., Army Chemical Center, Md.
INHALATION TOXICITY OF DIBORANE IN DOGS, RATS, AND GUINEA PIGS, by Charles C. Comstock, Leo Feinsilver and others. Mar 54, 18p. 20 refs. Medical Labs. research rept. no. 258.
Order from LC mi$2.40, ph$3.30 PB 140 309

Acute and chronic exposure figures were obtained. It is suggested that the maximum allowable concentration for chronic exposure of man be less than 0.8 mg/m^3 (1 ppm).

Radiobiology

Microwave Lab., Duke U., Durham, N. C.
ELECTRON SPIN RESONANCE STUDIES OF RADIATION DAMAGE. I. CERTAIN LIPIDS, HORMONES, AND VITAMINS. II. NUCLEIC ACIDS AND THEIR CONSTITUENTS, by Harvey N. Rexroad and Walter Gordy. Technical rept. on Contract DA 36-034-ORD-1233. 1 Feb 59, 63p. 7 refs. AD-211 352.
Order from LC mi$3.90, ph$10.80 PB 140 845

The present work applied the method of microwave electron spin resonance to the study of radiation damage to certain lipids, hormones, and vitamins. In the accompanying paper on the nucleic acids and their constituents, references are given to descriptions of the theory and experimental methods which are employed. The samples, which were in a powdered form, were irradiated by a kilo-curie cobalt 60 gamma-ray source. They were irradiated and observed under vacuum, were later exposed to air or oxygen and observed again at various intervals.

Oak Ridge National Lab., Tenn.
STUDIES ON THE MECHANISM OF LEUKEMOGENESIS BY IONIZING RADIATION, by A. C. Upton. Jan 59, 14p. 64 refs. AFSAM 59-17.
Order from LC mi$2.40, ph$3.30 PB 140 312

The induction of leukemia by ionizing radiation is influenced by many variables, including radiation intensity, radiation dose, fraction of the body irradiated, genetic differences in susceptibility, age at irradiation, sex, and other physiologic factors. The influence of these variables on the induction of leukemia varies with the hematologic type of leukemia induced. Irradiation increases the susceptibility of adult mice to filterable leukemogenic agents that, administered after irradiation, enhance the development of leukemia.

Texas U., Austin.
GENETIC EFFECTS OF COSMIC RAYS, by William S. Stone. Final rept. on Contract AF 49 49(638)51. 29 July 58, 4p. AFOSR TR-58-104; AD-162 246.
Order from LC mi$1.80, ph$1.80 PB 136 887

Microorganisms were prepared and sent to Minnesota for balloon flights as called for between December 1, 1956 through May 31, 1958. Control tests were run in the laboratory to test spontaneous mutation rates with these materials. The one successful short flight, 780, in which our material was flown carried Neurospora spores, which were tested for the presence of mutations by direct mutation test.

CHEMISTRY

Naval Research Lab., U. of Wisconsin, Madison.
EQUILIBRIUM ASSUMPTION IN THE THEORY OF ABSOLUTE REACTION RATES, by Charles F. Curtiss. Rept. on Contract NOrd 9938. 8 June 48. 76p. 14 refs. CM-476.
Order from LC mi$4.50, ph$12.30 PB 139 973

A mathematical treatment of the speed of chemical reactions.

Analytical Chemistry

Chesapeake Bay Inst., Johns Hopkins U. [Annapolis, Md.]
STUDY OF SOME MAJOR CATIONS IN NATURAL WATERS, by James H. Carpenter. Rept. on Contracts Nonr-248(20) and Nonr-248(30), Dec 57, 85p. 60 refs. Technical rept. 15; Reference 57-7.
Order from LC mi$4.80, ph$13.80 PB 136 726

A review is given of the composition of both fresh and sea waters and their interrelationships. Techniques for quicker analyses are proposed as well as for more versatile determinations of the major cations in marine and fresh waters. Testing methods also include flame photometry for sodium and potassium and complexometric titration for calcium and magnesium following ion exchange separation. Spectrophotometry is also employed. The Chesapeake Bay and its tributaries typify fresh water sources and are used to develop the information to a large degree on fresh waters and their ions.

Illinois U., Urbana.
OBSERVATIONS ON THE RARE EARTHS: CHEMICAL AND ELECTROCHEMICAL STUDIES IN NON-AQUEOUS SOLVENTS, by Therald Moeller and Dorian Sevcik Smith. Rept. on Contract AF 18(600)1535. 2 July 58, 119p. 67 refs. AFOSR [TN] 58-559; AD-158 377.
Order from LC mi$6.00, ph$18.30 PB 136 180

Several neodymium chloride alcoholates were prepared. Solubilities in their corresponding alcohols were determined; x-ray diffraction patterns were recorded. Diemethylformamide (DMF) proved to be unsatisfactory as a solvent from which to deposit rare earth metals. Samarium amalgam may be produced either electrolytically or chemically (using sodium amalgam) from DMF solutions of its trichloride. Electrolyses of samarium (III) chloride were performed in tetrahydrofuran and acetonitrile, but no deposition resulted. Conductance and electrolysis studies on strontium chloride in DMF indicated that this salt is a weak electrolyte. Electrolyses using various metal electrodes resulted in deposition of an amorphous strontium-containing material. Europium (II) chloride is only very slightly soluble in DMF, and thus electrolysis in this medium was precluded.

Inorganic Chemistry

Columbia U., New York.
THE VISCOSITY OF STEAM-NITROGEN MIXTURES AT ATMOSPHERIC PRESSURE AND ELEVATED TEMPERATURES, by Charles F. Bonilla, Stuart E. Grossberg and Elliot A. Taikeff. Final technical rept. on Contract Nonr-266(11). [Feb 58] 11p. 8 refs. Rept. no. CU-19-57-Nonr-266(11)-Ch. E.
Order from OTS $0.50 PB 151 533

The viscosity of 50 mole % mixtures of water vapor and nitrogen was measured by a capillary efflux viscometer from 345 to 860 C. The viscosity of the mixture averaged 1.5% higher than that of pure steam, disagreeing with available interpolation formulas for non-polar gas mixtures. It is concluded that mixtures high in water vapor, such as the combustion products of petroleum products burned with oxygen, have a viscosity close to that of the water vapor.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
SUMMARY OF THE PROPERTIES OF THE MORE FAMILIAR LITHIUM COMPOUNDS, by Mary Anne Hyle. 21 May 48, 43p. 25 refs. NEPA-545-EMR-3Q; AD-151 909.
Order from LC mi$3.30, ph$7.80 PB 140 088

Report is partly illegible.

Rensselaer Polytechnic Inst., Troy, N. Y.
CRYOSCOPE AND CONSTITUTION OF MOLTEN SALT MIXTURES IN THE LITHIUM CHLORIDE-POTASSIUM CHLORIDE EUTECTIC AND MERCURIC BROMIDE, by Jerome Goodkin and George J. Janz.

Technical note no. 8 on Contract AF 49(638)50. 18 Aug 58, 145p. 61 refs. AFOSR-TN-58-736; AD-162 269.
Order from OTS $2.75 PB 151 171

Organic Chemistry

Brigham Young U., Provo, Utah.
RHENIUM AND ITS COMPOUNDS AS HYDROGENATION CATALYSTS. III. PHENIUM HEPTOXIDE, by H. Smith Broadbent, Graham C. Campbell and others. Technical rept. no. 5 on Contract AF 18(600)1164. 11 Aug 58 [28]p. 29 refs. AFOSR TN-56-602; AD-115 030.
Order from OTS $0.75 PB 151 569

The hydrogenation catalytic activity of some rhenium "blacks" obtained by the reduction of commercially available rhenium heptoxide has been examined. These have been shown to be easily the most effective catalysts yet reported for the hydrogenation of the carboxylic acids to alcohols. They are also unusually effective in the hydrogenation of amides.

Florida U., Gainesville.
STUDY OF THE MECHANISMS OF THE REACTION OF SECONDARY AMINES WITH FORMALDEHYDE AND COMPOUNDS CONTAINING ACTIVE HYDROGENS, by George B. Butler, Roger A. Johnson and others. Technical rept. no. 3, 15 Dec 53-15 Mar 55, on Contract DA 01-009-ORD-257. [1955] 55p. 16 refs.
Order from LC mi$3.60, ph$9.30 PB 136 733

The objectives of this research problem are to investigate the Mannich reaction and reactions that may have a similar mechanism. Comparisons are to be made between recognized examples of the Mannich reaction and the reaction of secondary amines with formaldehyde and compounds containing hydrogen atoms activated through proximity to nitro groups.

Hormel Inst., U. of Minnesota, Austin.
INCLUSION COMPLEXES IN SOLUTION, by Hermann Schlenk. Technical rept. for 1 Feb 56-31 Dec 57 on Contract AF 18(603)18. [1957] 28p. 11 refs. AFOSR TR-59-30; AD-212 924.
Order from LC mi$2.70, ph$4.80 PB 140 216

The topic of this investigation is the interaction of α- and of β-cyclodextrin with other organic molecules in water. Experiments were conducted in two directions: (A) to study the change of properties of molecules in the role of guests, and (B) to study cyclodextrin in the role of host.

Kansas U., Lawrence.
PHYSICO-CHEMICAL INVESTIGATION OF ION EXCHANGERS, by Arthur W. Davidson, William J. Argersinger, Jr. and others. Final rept. on Contract N6ori-164(06). [1950] 94p. 19 refs. ATI-87 378.
Order from LC mi$5.40, ph$15.30 PB 140 433

Eight exchange systems involving the ions Na^+, H^+, NH_4^+, Ag^+, Tl^+, Ni^{++}, and Ca^{++} have been investigated. The equilibrium constant values are reported as functions of the equilibrium exchanger composition. In certain systems, particularly those involving either silver or thallous ion, adsorption of the exchanging electrolyte by the solid resin is observed. Such adsorption is in accordance with an adsorption isotherm of the usual kind.

Massachusetts Inst. of Tech., Cambridge.
STUDIES IN VINYL-METAL CHEMISTRY, by Dietmar Seyferth and M. A. Weiner. Technical rept. no. 1, 1 Aug 57-31 July 58, on Contract Nonr-1841(43). 31 July 58, 51p. 36 refs.
Order from LC mi$3.60, ph$9.30 PB 140 437

Contents:
Preparation of organosilicon- and organotin-substituted boranes and their oxidation to organosilicon- and organotin-substituted alcohols
Verification of the structure of some organosilicon compounds by nuclear magnetic resonance measurements
Infrared spectra of some group IV vinyl compounds
Some reactions of vinyl-metal compounds

Massachusetts U., Amherst.
O-ACYLHYDROXYLAMINES II. REACTION OF DIBENZYLAMINE WITH O-MESITOYLHYDROXYLAMINE, by Louis A. Carpino. Rept. on Contract AF 18(603)114. 10 Apr 59, 4p. 11 refs. AFOSR-TN-59-285; AD-212 918.
Order from LC mi$1.80, ph$1.80 PB 140 220

Massachusetts U., Amherst.
OXIDATIVE REACTIONS OF HYDRAZINES V. SYNTHESIS OF 1,1-DISUBSTITUTED HYDRAZINES AND THEIR SULFONYL DERIVATIVES, by Louis A. Carpino, A. A. Santilli, and R. W. Murray. Rept. on Contract AF 18(603)114. 10 Apr 59, 14p. 20 refs. AFOSR-TN-59-284; AD-212 917.
Order from LC mi$2.40, ph$3.30 PB 140 221

A series of 1,1-disubstituted hydrazines has been prepared, generally by reduction of the corresponding nitrosamines or nitramines.

Purdue U., Lafayette, Ind.
AN APPLICATION OF THE HAMMETT EQUATION TO SUBSTITUTED FERROCENE CARBOXYLIC ACIDS, by Robert A. Benkeser and Lewis W. Hall, Jr. Rept. on Contract AF 49(638)297. [1958] 9p. 14 refs. AFOSR TN-59-450; AD-215 025.
Order from LC mi$1.80, ph$1.80 PB 140 776

A series of substituted ferrocene carboxylic acids were prepared and their ionization constants measured.

University of Southern California, Los Angeles.
THE METHYLSTIBINES AND THE MONOMER DIMETHYLSTIBINOBORINE, by Anton B. Burg and

Louis R. Grant. Technical rept. no. 2 on Contract Nonr-228(13). 9 July 58, 18p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 140 785

Washington U., Seattle.
UNIMOLECULAR DECOMPOSITION OF CHEMICALLY ACTIVATED sec-BUTYL RADICALS FROM H ATOMS PLUS cis-BUTENE-2, by B. S. Rabinovitch and R. W. Diesen. Doctoral thesis. Technical rept. no. 2 on Contract Nonr-477(14). 15 July 58, 58p. 37 refs.
Order from LC mi$3.60, ph$9.30 PB 140 586

Chemically activated sec-butyl radicals have been produced at temperature between -103° and 25° C by reaction of H atoms with cis-butene-2. H atoms were allowed to effuse through a molecular slit into a spherical reactor containing clefine at low pressure. The system resembles the Polyani diffusion flame, and some solutions for the radial distribution functions of the species involved are given. Disproportionation - recombination ratios for sec-butyl radicals, and for methyl plus butyl radicals, were measured as 0.94 and 0.30 respectively. The ratios of stabilization vs decomposition by C-C rupture for the energized butyl radicals were measured as a function of pressure and temperature. Hydrogen and helium were also used as inert gases. k_a the observed rate constant for decomposition is 10^7 sec.$^{-1}$ The energized butyl radicals are effectively closely monoenergized energetic. The unimolecular decomposition behavior is compared with theory wherein expressions due to Marcus[2] are employed. All vibrational degrees of freedom may be taken as active.

Physical Chemistry

Antioch Coll., Yellow Springs, Ohio.
PHYSICAL CHEMISTRY OF AQUEOUS SOLUTIONS, by James F. Corwin. Quarterly rept. no. 5, 1 Mar-30 June 58, on Research on Aqueous Solutions at or above the Critical Temperature of Water, Contract DA 36-039-sc-73211. [1958] 17p.
Order from LC mi$2.40, ph$3.30 PB 140 257

The whole time on measurement of physical properties of water and water solutions was used in making measurements with the new platinum-lined equipment with great success. Most attention was devoted to the investigation of the reaction mechanisms concerning aluminum and Al_2O_3 with water, and the development of analytical procedures to examine these mechanisms.

Army Research Office, Washington, D. C.
FUEL CELLS, by Bernard R. Stein. Status rept. June 59, 113p. 23 refs. Rept. no. 1.
Order from OTS $1.25 PB 151 804

A survey of the most recent advances in the field of fuel cell research and development has been made. Military requirements and interest, a brief historical summary, bibliography, description and discussion of known fuel cell systems, and a tabulated abstract of the Department of Defense supported program are included. Appendices to the report comprise sections concerned with definitions; detailed fuel cell system data; basic thermodynamic considerations; a treatment of the production, storage, and handling of hydrogen, oxygen, and carbon monoxide; summary information on all Government contracts; and a listing of Department of Defense supporting basic research.

Calvin Coll., Grand Rapids, Mich.
THE ELECTROLYTIC TRANSITION OF Ag_2O TO AgO IN ALKALINE SOLUTIONS, by Thedford P. Dirkse. Technical rept. no. 6 on Contract Nonr-1682(01). 20 June 58, 12p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 140 282

An interrupted current technique was used for studying the electrolytic oxidation of silver in alkaline solutions. The short voltage peak just preceding the stage corresponding to the production of AgO in the voltage-time curves is interpreted as being due to the high electrical resistance of the Ag_2O layer.

Chicago U., Ill.
THERMODYNAMIC STUDY OF SiC UTILIZING A MASS SPECTROMETER, by J. Drowart, Giovanni de Maria, and M. G. Inghram. Technical rept. no. 7, 1 Jan-31 Mar 58, on Contract DA 11-022-ORD-1993. [1958] 29p. 7 refs. WAL-803/19-1; AD-137 065.
Order from LC mi$2.70, ph$4.80 PB 139 200

The sublimation of hexagonal SiC has been studied under equilibrium conditions. The predominant gaseous species above SiC are Si, SiC_2 and Si_2C. From the heat of formation of gaseous Si from solid SiC and the known standard heat of formation of SiC, a value of 113 kcal/gramatom is obtained for the heat of sublimation of Si. From the measured partial pressures, using estimated free energy functions, dissociation energies are calculated for Si_2, Si_3, SiC, SiC_2, Si_2C, Si_2C_2, Si_2C_3 and Si_3C.

Colorado U., Boulder.
THERMOCHEMICAL AND PHOTOCHEMICAL STUDIES ON ORGANIC FLUORINE COMPOUNDS, by J. L. Bitner, D. L. Bunbury and others. Final rept. on Contract AF 18(600)1151. 5 Aug 58, 196p. 97 refs. AFOSR TR-58-99; AD-162 198.
Order from LC mi$8.70, ph$30.30 PB 136 732

A great many fluorine-containing organic compounds were prepared and studied. There are sections on thermochemistry, photochemistry and synthesis of such compounds. Experimental data is presented as well as numerous graphs depicting and correlating such data. Alkyl and Aryl compounds were involved.

Columbia U., New York.
PARAMAGNETIC RESONANCE OF METHYL- AND CHLORO-SUBSTITUTED p-BENZOSEMIQUINONES, by Balu Venkataraman, Bernice G. Segal, and George K. Fraenkel. Rept. on Paramagnetic Resonance Absorption Spectroscopy, Contract AF 18(600)1390. 16 Oct 58, 40p. 35 refs. CU-15-58-AF-1390-Chem; AFOSR-TN-58-905; AD-204 430.
Order from LC mi$3.00, ph$6.30 PB 140 317

Detailed measurements, made under conditions of high resolution, of the paramagnetic resonance spectra of the negative radical ions of all the methyl- and chloro-substituted p-benzosemiquinones are reported.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DETERMINATION OF ELECTRONIC SPECIFIC HEAT IN Cu-Pd ALLOYS, by E. Klokholm. Final rept. for 1 Apr 56-30 Sep 57 on Contract Nonr-1887(00). [1957] 25p. 17 refs. F-A1931.
Order from LC mi$3.60, ph$9.30 PB 140 630

Description of apparatus for measurement of electronic contribution to the specific heat in Cu-Pd alloys. Some aspects of the unusual ordered structures found in this alloy system and the nature of the origin of the anomalous decrease in resistivity with plastic deformation are also discussed.

Gibbs Chemical Lab., Harvard U., Cambridge, Mass.
CHARACTERIZATION OF CELLULOSE AND POLYPEPTIDE POLYMERS. PART A. LIGHT SCATTERING STUDIES OF DILUTE SOLUTIONS OF GELATIN, by Helga Boedtker and Paul Doty. Technical rept. no. 1 on Contract N5ori-07654. 15 Dec 52, 9p. 2 refs. AD-210-678.
Order from LC mi$1.80, ph$1.80 PB 140 782

Illinois U., Urbana.
PRIMARY PHYSICAL AND PHOTOCHEMICAL PROCESSES IN CELLS AND MODEL SYSTEMS, by Eugene Rabinowitch. Annual rept. no. 9, 1 Jan-31 Dec 57, on Contracts N6ori-071(48) and Nonr-1834(16). 15 Nov 57, 12p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 136 764

Contents:
Reversible bleaching of chlorophyll in vivo
Decay of chlorophyll excitation
Fluorescence spectra and action spectra of fluorescence of living cells
Reversible reaction of chlorophyll in solution
Energy migration in fluorescein solutions
Dimerization of dyes and fluorescence
(See also PB 132 319)

Instituto de Quimica Fisica (Spain)
KINETICS OF THE SULPHURATION OF METALLIC SURFACES, by J. Llopis, J. M. Gamboa, and L. Arizmendi. Annual rept. no. 1 on Contract AF 61(514)1329. May 58, 59p. 89 refs. AFOSR TN-58-639; AD-162 170.
Order from LC mi$3.60, ph$9.30 PB 136 867

Metallic disks of a certain size are introduced into the reacting solutions and moved in simultaneous translation and rotation, by a small motor running at 60 r.p.m. From the measurements of the radioactivity on the surface of the disks the amount of deposited sulphur can be calculated. This experimental method has been applied to (1) the surface reaction of copper and platinum with aqueous solutions of thiourea; (2) the surface reaction of copper with sodium polysulphide solutions; (3) the surface reaction of copper with sulphur dissolved in benzene.

Instituto Nacional de Tecnica Aeronautica Esteban Terradas (Spain)
COMPARISON OF ANALYTICAL METHODS FOR THE CALCULATION OF LAMINAR FLAME VELOCITY, by G. Millan and I. Da Riva. Rept. on Contract AF 61(514)997. June 58, 20p. 3 refs. AFOSR TN-58-812; AD-202 357.
Order from LC mi$2.40, ph$3.30 PB 136 875

This paper is divided into two parts. Part I establishes the flame equations through the usual application of the following simplifications: the molecular weight and specific heat of the mixture are constant, and thermal conductivity is independent from the composition but it varies linearily with temperature. Part II is devoted to a study of the methods under consideration by applying them to a short number of particular cases.

Instituto Nacional de Tecnica Aeronautica Esteban Terradas (Spain)
PREDICTION OF THE PROPAGATION VELOCITY OF LAMINAR FLAME SUPPORTED BY A SECOND-ORDER REACTION, by J. M. de Sendagorta. Rept. on Contract AF 61(514)997. Apr 58, 10p. 2 refs. AFOSR TN-58-770; AD-201 867.
Order from LC mi$1.80, ph$1.80 PB 136 840

The present Technical Note is as an extension of a previous work in which an analytical method for the computation of the propagation velocity of laminar flames was reported. It deals with an alternative of the method proposed for the case where the flame is supported by a second-order reaction and the Lewis-Semenov Number differs from unity.

Istituto Elettrotecnico Nazionale ["Galileo Ferraris"] (Italy)
ON F AND V CENTERS THERMOLUMINESCENT RECOMBINATION, by G. Bonfiglioli, P. Brovetto, and C. Cortese. Rept. on Contract AF 61(514)1333. [1958] 4p. 9 refs. AFOSR TN-58-751; AD-201 503.
Order from LC mi$1.80, ph$1.80 PB 136 836

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF SINTERED ALUMINA AS A FILTER MEDIUM FOR SUBMARINE ION EXCHANGERS, by L. Deutsch and R. Soukup, Final rept. 30 Jan 59, 5p. 2 refs. Lab. project 5623-4.
Order from LC mi$1.80, ph$1.80 PB 140 494

Naval Research Lab., Washington, D. C.
THE STABILITY AND SURFACE TENSION OF TEFLON DISPERSIONS IN WATER, by N. L. Jarvis and W. A. Zisman. 6 May 59, 21p. 31 refs. NRL rept. 5306.
Order from OTS $0.75 PB 151 635

The stability of a dispersion of solid Teflon particles in water will be dependent upon the surface tension of the solution. Only when the surface tension of the solution approaches the critical surface tension of Teflon, 18 to 19 dynes/cm, will zero contact angle and maximum stability of the dispersion be attained. However, surface tension values observed for solutions of a single conventional wetting agent never go below 26 to 27 dynes/cm at 20°C. Limiting values of between 22 and 24 dynes/cm for conventional wetting agents can be predicted from a consideration of the critical surface tension of wetting of hydrocarbon surfaces, and lower values cannot be expected when mixtures of such wetting agents are employed. The problem of obtaining stable, reproducible, Teflon dispersions involves the proper choice of wetting agents and an adequate control of their surface tensions during formulation, storage, and application. A variation of the maximum bubble pressure method for measuring surface tensions due to Cassel was found especially suitable for determining the surface tensions of Teflon dispersions.

Palmer Physical Lab., Princeton U., N. J.
INVESTIGATION OF THE EFFECT OF GAS OSCILLATORS AND OPTICAL PUMPING ON THE BREADTH OF SPECTRAL LINES: MICROWAVE ATOMIC OSCILLATOR USING THE HYPERFINE TRANSITION OF Rb^{87}, by R. H. Dicke, T. R. Carver and others. Quarterly rept. no. 8 for 1 June-30 Sep 57 on Contract DA 36-039-sc-70147; Final rept. on Microwave Detection Phase. [1957] 78p. 28 refs.
Order from LC mi$4.50, ph$12.30 PB 140 295

The purpose of this investigation is to study the effects of gas collisions on the Doppler width of microwave spectral lines and to utilize optical pumping to reduce exchange collisions broadening and increase signal power for use in atomic frequency standards. The possibility of the use of an atomic oscillator employing atomic amplification is also to be investigated.

Pennsylvania State U. Coll. of Mineral Industries, University Park.
SOLID STATE CHEMISTRY, by W. A. Weyl and E. C. Marboe. Technical rept. no. 76 (Final) for 1948-1957 on Contract N6onr-269(08). Dec 57, 37p. 52 refs.
Order from OTS $1.00 PB 151 440

About 75 research papers and corresponding publications on investigations into the nature of the solid state of matter are reviewed. Although modern physics requires a rigorous quantum-mechanical approach to chemical forces and reactions, only the most simple phenomena can be treated in that way, while all other observable facts are explained by imitating quantum mechanics in a qualitative manner by introducing such concepts as "polarizability" or "screening" as expression of mutual interaction of ions and the inherent "inconstancy" of the ultimate building units of matter. Properties of ions and molecules become functions of their environment and chemical forces acquire a radius of activity extending over hundreds of atoms. These concepts allow an interpretation of such properties of solids as melting point, hardness, and mechanical strength and explain phenomena such as reaction rate, catalysis, aging, and hydrolysis on an atomistic basis. The investigations covered such wide and diversified fields of basic and applied chemistry as relations between mechanical properties and chemical composition of crystals and glasses; the interaction of small particles as a rheologic basis of ceramics; electronic properties of semiconductors generated by partial oxidation or reduction as well as by impurities; the anomalous physico-chemical behavior of water; fused salts and solids; the reaction rate in hydrolytic and other chemical reactions as the result of the "unscreening" of ions. (see also PB 151 439)

Purdue U., Lafayette, Ind.
HETEROGENEITY AS A FACTOR IN THE ALKYLATION OF AMBIDENT ANIONS: PHENOXIDE IONS, by Nathan Kornblum and Arnold P. Lurie. Rept. on Contract AF 49(638)324. June 58, 44p. 18 refs. AFOSR TN-58-939; AD-205 087.
Order from LC mi$3.30, ph$7.80 PB 140 580

Sodium and potassium salts of phenol and p-tert-octylphenol have been alkylated with benzyl and allyl halides in a variety of solvents. Quantitative yields of the ether (oxygen alkylation) are obtained whenever the reaction is conducted in solution. In addition, it is demonstrated that the truly heterogeneous reaction gives exclusively carbon alkylation. Reactions carried out with the phenolic salt present as a solid phase ordinarily give both carbon and oxygen alkylation, but this result is clearly a consequence of incursion by the homogeneous process. The factors, other than heterogeneity, which may influence the course of phenoxide alkylations are briefly discussed. An explanation is offered for the fact that heterogeneity confers an essentially irresistible preference for carbon alkylation.

Rensselaer Polytechnic Inst., Troy, N. Y.
STRUCTURE OF MOLTEN MERCURIC HALIDES, by James D. E. McIntyre and George J. Janz. Technical note no. 10 on Contract AF 49(638)50. Mar 59, 28p. 30 refs. AFOSR TN-59-310; AD-213 242.
Order from LC mi$2.70, ph$4.80 PB 140 582

The physical properties and structures of the mercuric halides for the solid, gaseous, and liquid states are reviewed. Two models for the liquid state are proposed, one due to complete self-dissociation with the formation of the complex ions, $Hg X^{+}$ and $Hg X_3^{-}$, as the predominant species, and the second in which the molten salt consists primarily of the molecular species, $Hg X_2$. The evidence of electrical conductance and viscosity is examined in the light of both models, using mercuric bromide as example. The percentage of ions free to conduct on this melt is shown to be 2×10^{-2}. The conditions under which calculations of the degree of ionic dissociation by the concept of reduced conductance for molten salts are discussed.

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN SALTS, comp. by Charles Brown, Henry J. Gardner and others. Bibliography [for period ending] 1958 on Contract AF 49(638)50. Sep 58, 73p. approx. 1000 refs. Technical Note no. 9; AFOSR TN-58-773;

AD-201 776.
Order from OTS $2.00 PB 151 429

The bibliography is based on a survey of the information published up to 1958 in the technical press on the subject of molten salts. The references have been classified for the bibliography under the following headings: apparatus and techniques, cryoscopy, diffusion and electromigration, electrical conductance, electrode processes, reviews, liquid structure, phase equilibria, physical properties, process of fusion, solutions of metals, spectroscopy and bonding, thermochemistry, and thermodynamics. Each contribution is listed by author, journal, and title of the article.

School of Aviation Medicine, Randolph AFB, Tex.
SPECTROPHOTOMETRIC CHARACTERIZATION OF LIGHT-INDUCED CHANGES IN AUTOPOLYMERIZING RESINS; THE EFFECT OF ULTRAVIOLET LIGHT UPON VARIOUS RESIN LIQUIDS, by Bertram Eichel, Theodore E. Fischer, and John E. Sartore. Sep 57, 9p. 2 refs. Rept. 57-123.
Order from LC mi$1.80, ph$1.80 PB 140 374

Three commercial plastic dental filling liquids—Fastcrown, Kadon, and Replica, which minimally contain monomeric resin, inhibitor, and promoter—and one noncommercial promoter free liquid, which contained only monomeric resin and inhibitor, were placed in ethylene dichloride solution and exposed to long and short-wave ultraviolet radiation. Promoter-free liquid did not show any significant differences in absorption in the visible or near ultraviolet spectrum, whereas the opposite was true for p-dimethyl toluidine, indicating that the promoter was necessary to initiate color changes. Long-wave ultraviolet produced greater color absorption in the Fastcrown and Replica liquids than did exposure to short-wave radiation. Kadon liquid produced near equal large amounts of color and near ultraviolet absorption following long or short-wave ultraviolet irradiation.

Stanford Research Inst., Menlo Park, Calif.
MECHANISM OF FLAME INHIBITION, by Willis A. Rosser, Jr., Jacob H. Miller and others. Final rept. for Phaze II, Contract DA 44-009-eng-2863. 30 June 58, 30p. 22 refs.
Order from OTS $1.00 PB 151 438

In order to elucidate the mechanism of combustion inhibition by halogen compounds the study of such inhibition was extended during the second phase of this program to include the effects of bromine compounds on (a) the maximum temperature of premixed methane-air flames, (b) the flame spectra of premixed methane-air flames, (c) the quenching of such flames by solid surfaces, and (d) the low temperature oxidation of methane. These studies also indicate that the essential effect of halogen inhibitors on premixed hydrocarbon-air flames is the reduction in the rate of chemical reaction as manifested by a reduction of flame speed. The associated changes in quenching phenomena are necessary consequences of this reduction.

Sterling Chemistry Lab., Yale U., New Haven, Conn.
HIGH FIELD CONDUCTANCE RESEARCH, by Andrew Patterson, Jr. Final rept. for 1 Feb 51-30 June 58 on Contract Nonr-215(00). 1 July 58, 6p. 22 refs.
Order from LC mi$1.80, ph$1.80 PB 140 441

A new measurement technique has been devised. A considerable variety of weak and strong electrolytes have been studied, precise data on them obtained, and the range of validity of the theories for these two phenomena established.

Surface Chemistry Lab., Lehigh U., Bethlehem, Pa.
HETEROGENEITY OF SURFACES: CALORIMETRIC AND ADSORPTION STUDIES OF WATER ON Ni, Co AND Cu. STUDY OF FACTORS AFFECTING THE DEGREE OF REGENERATION OF OXIDIZED Ni, Co AND Cu SURFACES, by A. C. Zettlemoyer and Yang-Fang Yu. Technical rept. no. 2, 1 June 57-15 July 58, on Contract Nonr-1820(00). July 58, 35p. 17 refs.
Order from LC mi$3.00, ph$6.30 PB 140 477

Isotherms and calorimetric heats of adsorption of water on reduced, oxidized and regenerated nickel, cobalt and copper surfaces have been determined. The degree of regeneration of oxidized nickel, cobalt and copper surfaces has been measured by the subsequent oxygen uptake during the fast step of the oxidation process.

University of Southern California, Los Angeles.
PHOTOIONIZATION ANALYSIS BY MASS SPECTROSCOPY, by G. L. Weissler, J. A. R. Samson and others. Technical rept. no. 21 on Contract Nonr-228(11). 1 Aug 58, 50p. 56 refs.
Order from LC mi$3.30, ph$7.80 PB 140 709

A vacuum ultraviolet monochromator has been combined with a mass spectrometer similar to previously reported instrumentation to study photoionization processes between 1570A and 430A.

Warner and Swasey Co., New York.
INFRARED SPECTRAL EMISSIVITIES AND INTERNAL ENERGY DISTRIBUTION OF CARBON DIOXIDE AT HIGH TEMPERATURES. PART I. INTERNAL ENERGY CALCULATIONS, by Richard H. Tourin and Paul M. Henry. Scientific rept. no. 2 on Contract AF 19(604)2223. Dec 58, 63p. 22 refs. AFCRC TN-59-262; AD-212 969.
Order from LC mi$3.90, ph$10.80 PB 140 211

The distribution of the internal energy of carbon dioxide among various degrees of freedom has been calculated as a function of temperature. This work is part of a program of measurement of infrared spectral emissivities of radiating hot gases. Energies of vibration, rotation, and dissociation were calculated explicitly for CO_2 at temperatures up to 3500°K, for correlation with experimental data. Various calculation procedures were developed and are described.

Institute of Engineering Research, U. of California, Berkeley.
THE SNOW EMISSIVITY METER AND ITS USE IN EVALUATING THE EMISSIVITY OF ICE, FROZEN GROUND AND OTHER MATERIALS, by R. V. Dunkle and J. T. Gier. Rept. on Contract DA 11-190-eng-3. 15 Dec 53, 15p. 2 refs. Series no. 62, issue no. 3.
Order from LC mi$2.40, ph$3.30 PB 127 929

An objective of this test is the measurement of the total emissivity and absorptivity of wet and dry snow, ice, frozen ground and materials used in the arctic regions. The snow Emissivity Meter, was designed utilizing a mirror to focus the incident energy upon a thermopile detector and an ideal radiator for controlling radiation from the surrounds. The preliminary results obtained from laboratory testing are reported herein.

Quartermaster Research and [Engineering] Center, Natick, Mass.
A STUDY OF DESERT SURFACE CONDITIONS, by Thomas Clements, Richard H. Merriam and others (U. of Southern California). Apr 57, 130p. 47 refs. Technical rept. EP-53; AD-142 865.
Order from LC mi$6.30, ph$19.80 PB 140 373

An empirical classification of world representative desert surface types has been developed in the course of twenty months of research, using field and laboratory techniques, in the desert regions of southwestern United States. Each of the principal types was encountered during the course of the field investigations, and is represented both in the United States and in foreign desert regions. On the basis of land forms and their associated surface characteristics, the classification recognizes the following types: (1) Playas, of which there are five subtypes; (2) Desert Flats; (3) Bedrock Fields, in three categories; (4) Regions Bordering Through-flowing Streams; (5) Alluvial Fans and Bajadas; (6) Dunes; (7) Dry Washes; (8) Badlands; (9) Volcanic Cones and Fields; and (10) Desert Mountains. The following surface materials were noted during the course of the field research: salt, lime, clay, silt, sand, gravel, boulder, desert pavement, and bare rock. The greatest contrasts between the deserts of the United States and those of the Eastern Hemisphere are found in the amounts and distribution of Dune areas, Fans and Bajadas, and Bedrock Fields.

Texas U., Austin.
COASTAL STUDY OF SOUTHWEST MEXICO, by Donald D. Brand. Technical rept. no. 1 on Contract Nonr-375(06). 15 June 57, 175p. 291 refs. AD-139 014
Order from LC mi$8.10, ph$27.30 PB 136 467

Contents:
The coast of Michoacan
  Political structure
  History
  Geographic location
  Coastal forms and terrain
  Climate and biota
  Hydrography
  The people
  Travel and traversability
Beach cusps and a proposed explanation
  Field observations
Rainfall analysis for some stations in Southwest Mexico
  Ratios of variation
  Cumulative summation and the ecart pluviometrique relatif
  Trends of precipitation
The marine exploration, survey, and history of the Michoacan coast
Summary of the early hydrographic survey of the Michoacan coast

Climatology and Meteorology

Air Weather Service [Washington, D. C.]
A DIGEST OF OBJECTIVE METHODS FOR FORECASTING STRONG SURFACE WINDS (SOUTHWESTERN UNITED STATES - EARLY SPRING) by Thomas H. Simmonds. Apr 59, 80p. AWS Technical rept. no. 105-149.
Order from LC mi$4.50, ph$12.30 PB 140 578

This report is published for use as a guide to objective forecasting methods for strong, gusty surface winds in the Southwestern United States and for other areas having a similar problem. The methods can also be used by detachments forecasting for flights into the Southwestern United States.

Allied Research Associates, Inc., Boston, Mass.
DESIGN OF AN EXPERIMENT TO EVALUATE RADAR AS A TOOL FOR SHORT RANGE FORECASTING, by Roland J. Boucher and Raymond Wexler. Scientific no. 1 on Contract AF 19(604)3881. 24 Mar 59, 25p. 14 refs. AFCRC TN-59-257; AD-212 554.
Order from LC mi$2.70, ph$4.80 PB 140 228

The present status of radar as a tool is briefly reviewed. In the design of an experiment to test the usefulness of radar in short range terminal forecasts, it is proposed to use existing files of recorded radar and weather data, thereby condensing several years experience into a few months. Forecasts made with and without radar from the "canned" data will be scored against probability and the usefulness of the radar established from the significance of the score differences obtained.

Blue Hill Meteorological Observatory, Milton, Mass.
DEVELOPMENT AND GROWTH OF PRECIPITATION IN THREE NEW ENGLAND COASTAL CYCLONES: RADAR-SYNOPTIC ANALYSIS, by Roland J. Boucher. Rept. on Meteorological Radar Studies no. 9, Contract AF 19(604)950. 21 Mar 58, 47p. 10 refs. AFCRC-TN-58-210; AD-146 884.
Order from LC mi$3.30, ph$7.80 135 962

Three New England coastal storms (northeasters) are studied by means of conventional synoptic analyses and radar, in seeking information on the processes which produce the heavy precipitation characteristic of this type of storm. The evidence obtained, much of it through the use of reflectivity cross-sections constructed from gain-stepped RHI pictures, indicates that the precipitation process within 200 miles of the Low center is characterized by vertical motions or updrafts of limited horizontal dimensions and of a higher order of magnitude than the large scale vertical motions generally ascribed to macroscale cyclonic circulations. The vigor of the localized updrafts appears to vary inversely with the distance from the cyclonic center. In the innermost region of the zone of most active precipitation, within 100 miles of the low center, and dependent upon the rate of intensification (deepening) of the cyclone, are often found vertical structures producing radar echoes with high intensity cores which seem related to the occurrency of graupel. In the two storms wherein this feature was noted, thunderstorms occurred. The close relation of broad bands on the PPI to the sea level isobars suggests the possibility of establishing an operationally useful technique for tracking the motion and state of development of this type of storm when the precipitation is in the form of dry snow.

Chicago U., Ill.
JET STREAM AND LONG WAVES IN A STEADY ROTATING DISHPAN EXPERIMENT. PART II: GENERAL CIRCULATION MECHANISMS, by Herbert Riehl and Dave Fultz. Research rept. on Contract N6ori-020(36); Scientific rept. no. 2 on Contract AF 19(604)1292. Oct 57, 71p. 2 refs.
Order from LC mi$4.50, ph$12.30 PB 136 707

This is the continuation of a previous article in which the structure of the steady rotating dishpan experiment was described. The present article begins with a calculation of the heat balance and a determination of the mechanisms that transport heat from heat to cold source. Of particular interest is the question whether the heat transport is effected by quasi-geostrophic horizontal or by non-geostrophic vertical circulations. Calculations were performed in the conventional polar coordinate system and also in a curvilinear coordinate system following the jet stream axis. In polar coordinates the heat transport is accomplished largely by horizontal circulations, and in the curvilinear coordinate system by an ageostrophic vertical mass circulation. Thus the "mechanism" of heat transfer that is found depends largely on the framework of reference in which calculations are made.

Florida State U., Tallahassee.
SOME DETAILS OF THE WIND FIELD IN INDIVIDUAL HURRICANES, by William Blumen and Noel E. LaSeur. Scientific rept. no. 7 on Contract AF 19(604)753. 31 July 58, 51p. 6 refs. AFCRC-TN-58-447; AD-152 633.
Order from LC mi$3.60, ph$9.30 PB 135 959

During the 1955 hurricane season a research flight program was undertaken in which wind observations were recorded at intervals of 1-2 miles in various hurricanes. These observations permitted, for the first time, more detailed analyses of the hurricane field of motion, including some "meso-scale" features along portions of the flight track. This report presents such analyses, which include: the total velocity field; radial and tangential components; divergence and relative vorticity. Operational limitations with one aircraft have restricted these analyses to a different level in each of three hurricanes, in various stages of development. Nevertheless certain features such as the order of magnitude of divergence and vorticity and their distributions, are very similar in the innermost storm region within a 1-2 deg radius of the center. Variations from average conditions are found in different quadrants and these might prove to be significant in understanding the more basic storm processes, such as entrainment and differential vertical motion. Regions of negative absolute vorticity are clearly established in the low and high levels, but it is carefully pointed out that this feature, as well as others, are characteristic of these individual flights, and should not be generalized for all hurricanes at these levels.

Florida State U., Tallahassee.
USEFUL SATELLITE ORBITS FOR SOME HIGH-ALTITUDE WEATHER OBSERVATIONS, by Warren A. Dryden. Scientific rept. no. 1 on Contract AF 19(604)1754. 15 Aug 58, 45p. 2 refs. AFCRC-TN-58-474.
Order from LC mi$3.30, ph$7.80 PB 136 760

A discussion of the utilization of an artificial, unmanned satellite for the purpose of tracking atmospheric disturbances is presented. The disturbances are presumed to be recognized by cloud patterns viewed from high altitudes by means of a satellite-borne television camera which transmits an image to a telemetering station at the surface. Successive positions and, hence, the movements of these disturbed areas would be determined from the known position of the satellite. The usefulness of a satellite orbiting under the influence of its mutual gravitational attraction with the earth is presumed to be determined by the longitudinal displacements from day to day. The daily displacement is found to be a linear function of the elevation of the satellite.

Geophysical Inst., U. of Alaska, College.
ATMOSPHERIC OZONE AT COLLEGE, ALASKA, by Gerald Romick and Wallace Murray. Final rept. on Contract AF 19(604)1817. Apr 57, 51p. 13 refs. AFCRC-TR-57-294; AD-117 250.
Order from LC mi$3.60, ph$9.30 PB 136 170

Data from a previous contract were analyzed to obtain the vertical distribution of ozone from the Umkehr theory. The method employed is extensively described. The analysis of the data shows a highly fluctuating distribution with the possibility of a larger percentage of the total amount of ozone in the higher layers of the atmosphere than is normally shown in data published from other stations. Infrared techniques for monitoring the ozone in the 9.6 micron band of the spectrum of the atmosphere are given. These techniques are more favorable for the winter months than are the ultraviolet measurements using the Dobson Spectrophotometer. Preliminary experimental results suggest a possible correlation between the aurora and ozone.

Hawaii Inst. of Geophysics, Honolulu.
DEVIATION OF GEOSTROPHIC WIND FROM MEASURED WIND AT 500 MB, by Leighton E. Worthley, Jr. Scientific rept. no. 4 on Contract AF 19(604)1942. Apr 59, 14p. 14 refs. AFCRC TN-58-634.
Order from LC mi$2.40, ph$3.30 PB 140 704

Introduction of the automatic radar navigation equipment to aerial weather reconnaissance makes possible a new and rather extensive study of the deviation of geostrophic wind from measured wind. All data used in this study, with the exception of those from Kwajalein, where taken from Air Weather Service fixed track reconnaissance observations at 500 mb.

Institute of Atmospheric Physics, U. of Arizona, Tucson.
VARIABILITY OF PRECIPITATION IN AN ARID REGION: A SURVEY OF CHARACTERISTICS FOR ARIZONA, by James E. McDonald. Technical rept. no. 1 on Meteorology and Climatology of Arid Regions, Contract NSF-G1101. 31 Dec 56, 110p. 20 refs. AD-121 994.
Order from LC mi$5.70, ph$16.80 PB 136 882

Most of the work summerized has been of the nature of initial exploratory investigations made in order to lay the foundation for the much more extensive studies that will shortly be begun as part of the University of Arizona-U. S. Weather Bureau Cooperative Punchcard Climatological program. A selected sample of long-record Weather Bureau precipitation stations in Arizona were analyzed for their historic variability properties, a number of statistical and calculational techniques were tested, and a general plan has been developed for the next phases of the variability program.

Institute of Mathematical Sciences, New York U., N. Y.
GEOSTROPTIC VORTEX MOTION II. APPLICATION TO HURRICANE TRACKING, by G. K. Morikawa. Progress rept. on Contract AF 19(604)2265. Aug 58, 13p. 2 refs. IMM-NYU 252; AFCRC TN-58-492.
Order from LC mi$2.40, ph$3.30 PB 136 880

MacDonald Physics Lab., McGill U. (Canada).
GROWTH OF PRECIPITATION ELEMENTS BY SUBLIMATION AND ACCRETION, by R. H. Douglas. Scientific rept. MW-26 on Contract AF 19(604)2065; Continuation of Contract AF 19(122)217. May 57, 34p. 22 refs. AFCRC-TN-57-456; AD-117 204.
Order from LC mi$3.00, ph$6.30 PB 127 916

Heat of fusion, released during accretion, reduces the vapor density excess and inhibits the sublimational growth of an ice particle. This inhibition is a negligible fraction of the total growth rate, which can therefore be considered as the sum of the purely sublimational and accretional components. Particle density has a pronounced effect upon the collection characteristics, the denser particle being the more efficient collector. Growth computations are made taking into account the change of particle density as low density material is accreted. In cloud of low water content, such as altostratus, and in snow generating cells, growth of precipitation elements is predominantly by sublimation and aggregation, yielding snow. In the dense cores of cumuli, where liquid water contents may exceed 1 gm m^{-3}, accretional growth yields graupel; near the cloud boundary, however, where water contents are reduced by mixing, predominantly sublimational growth yields snow. Growth of an ice particle by the sublimation-accretion process is more rapid than that of a droplet by coalescence, provided that the particle density remains high; with low density accretion, however, the all-water process may be the more rapid.

Marine Lab., U. of Miami, Coral Gables, Fla.
INVESTIGATION OF RAINFALL MEASUREMENT BY RADAR, by H. W. Hiser, P. R. Ray, and L. F. Conover. Final rept. for 1 July 57-30 June 58 on Contract Cwb-9283. June 58, 61p. 5 refs.
Order from LC mi$3.90, ph$10.80 PB 136 758

A breadboard type installation of a storage tube was made in a Navy model VD-2 repeater. System dynamic range tests were run for the equipment used by the project for photo-integration of rainfall echoes. The system dynamic range was found to be about 15 decibels in terms of power received from a target or about 10 decibels in terms of rainfall as given by the theoretical radar-rainfall equation. The dynamic range of the Fine Grain Positive film used far exceeds that of the radar. Investigations of the model VD-2 radar repeater showed it to be the weakest link in the system in use on the project. The signal dynamic range and the bandwidth of its video amplifier are inadequate. Its unblanking gate appears to be influencing the CRT beam intensity.

Massachusetts Inst. of Tech., Cambridge.
THE APPLICATION OF PRESSURE-AVERAGED FLOW TO THE PROBLEM OF HURRICANE DISPLACEMENT, by Frederick Sanders. Scientific rept. no. 6 on Contract AF 19(604)1305. Feb 59, 77p. 6 refs. AFCRC-TR-59-254; AD-212 263.
Order from LC mi$4.50, ph$12.30 PB 140 579

The motion of hurricanes is considered in relation to the pattern of flow averaged with respect to pressure over the layer bounded by the 1000-mb and 100-mb surfaces. Application of the barotropic prediction model to such a flow, together with an appropriate graphical horizontal averaging of the pattern of flow, yields a basic "steering" current in accordance with which the hurricane may be expected to move. The motion of hurricanes Carol and Hazel of 1954, Betsy of 1956, and Daisy and Ella of 1958 is compared with corresponding patterns of the steering current. Comparisons are made between the pressure-averaged flow and the flow at the 500-mb level. Limited attempts are made to utilize a stream function based solely upon the observed winds. It is concluded that significantly greater accuracy in the short-range prediction of hurricane displacement can be achieved only with a substantial increase in the amount of data available throughout the troposphere in the vicinity of the storm, and that this accuracy is strictly limited in any event by the precision with which the evolution of the large-scale flow pattern may be predicted.

Massachusetts Inst. of Tech., Cambridge.
DISTRIBUTION AND GROWTH OF HYDROMETEORS AROUND A DEEP CYCLONE, by Robert M. Cunningham. Doctoral thesis. Technical rept. no. 18 on Contract DA 36-039-sc-124. 9 May 52, 116p. 37 refs.
Order from LC mi$6.00, ph$18.30 PB 136 009

This thesis analyzes one storm completely, and reference is made to other storm soundings made.

Massachusetts Inst. of Tech., Cambridge.
PROSPECTS FOR STATISTICAL WEATHER FORECASTING, by Edward N. Lorenz. Final rept. on Statistical Forecasting Project, Contract AF 19(604)1566. Jan 59, 189p. 15 refs AFCRC TR-59-224; AD-211 603.
Order from LC mi$8.40, ph$28.80 PB 140 665

The principle is stated that in establishing any statistical formula, graph, or table for forecasting, the number of degrees of freedom allowed must be small compared to the number of independent observations of the predictand used, if the relationship is to succeed when applied to new data. To reduce the number of degrees of freedom by reducing the number of predictors, the Statistical Forecasting Project introduced the use of empirical orthogonal functions to represent a field of predictors. This procedure was successful in reducing the number of degrees of freedom, but it did not lead to better forecasts than those obtained by other procedures. Nonlinear forecasting procedures seem to offer the best hope of surpassing the plateau. The nonlinear dynamic and synoptic phenomena of advection, displacement of systems, and steering suggest one particular nonlinear forecasting procedure. Schemes for the theoretical investigation of the predictability of weather may be based upon simplified forms of the dynamic equations.

Massachusetts Inst. of Tech., Cambridge.
RECORDER FOR AN AIRBORNE LIQUID WATER CONTENT MEASURING INSTRUMENT. PART A: AIRBORNE RECORDER FOR LIQUID WATER CONTENT MEASURING INSTRUMENT. PART B: EVALUATION OF THE RECORDING CAPILLARY COLLECTOR, by Clayton E. Jensen (Master's thesis) Alan C. Bemis, and Robert M. Cunningham. Technical rept. no. 16 on Contract DA 36-039-sc-124. 15 July 51, 53p. 19 refs.
Order from LC mi$3.60, ph$9.30 PB 136 007

Supplemental instrumentation has been devised for the purpose of obtaining a permanent record of water collection rate in flight. This instrumentation is intended to add to, and, hence, correct the deficiency of, the present capillary collector system which employs manual reading and resetting. The record obtained will be continuous with the exception of the time necessary for automatic resetting of the water column level.

Naval Research Lab., Washington, D. C.
THE PARACHUTE-DELIVERABLE BUOY-TYPE AUTOMATIC WEATHER STATION, by W. A. Von Wald, Jr., and R. B. Bridge. Interim rept. 12 May 59 31p. NRL rept 5272.
Order from OTS $1.00 PB 151 427

Weather information is often required from critical areas where routine meteorological observations are not made or can be made only at considerable expense. As part of a continuing program to develop means for obtaining meteorological data from remote or inaccessible regions, a free-floating, buoy-type automatic weather station has been developed which is capable of telemetering data over distances of thousands of miles continuously for several months. This buoy is housed in a case patterned after an airborne torpedo, which permits an aircraft to deliver it by parachute to its operating locality with a minimum of modification to the standard equipment available aboard combat aircraft. Present models of the bouy contain sensors for air temperature, water temperature, barometric pressure, wind direction, and wind velocity, but the system is sufficiently versatile to allow a variety of other sensors and control equipments to be installed.

New York U. Coll. of Engineering, N. Y.
THE RELATION BETWEEN GEOMAGNETIC VARIATIONS AND THE CIRCULATION AT 100 MB, by Julius London, Irwin Ruff, and Leo J. Tick. Scientific rept. no. 8 on Contract AF 19(604)1738. Feb 59, 26p. 16 refs. AFCRC-TN-59-236; AD-211 109.
Order from LC mi$2.70, ph$4.80 PB 140 229

Statistical methods are used to study the relationship, over a five year period, between geomagnetic storms and the height gradients of the 100 mb surface over the U. S. In the case of the superposed epoch analysis, the parameters studied were variations from population values of the mean height gradients and the standard deviation of the height gradients for the period five days before to fifteen days following the geomagnetic storm. No pattern was found in the tested statistical significance at the 5% and 1% levels. The geomagnetic and height gradient spectra were constructed from the two time series and the coherence between the two series was computed. The coherence was found to be very small for all periods from 4 to 60 days. The conclusion is drawn that there is no obvious relationship between the two sets of data.

New York U. Coll. of Engineering, N. Y.
THE WIND AND TEMPERATURE SPECTRA OF THE UPPER TROPOSPHERE AND LOWER STRATOSPHERE OVER NORTH AMERICA, by Wan-cheng Chiu. Scientific rept. no. 4 on Contract AF 19 (604)1755. Feb 59, 58p. 20 refs. AFCRC TN-59-235; AD-211 108.
Order from LC mi$3.60, ph$9.30 PB 140 212

The wind and temperature spectra of the upper troposphere and lower stratosphere over selected North American stations are constructed, by means of Tukey's method, from rawinsonde and radiosonde data taken by these stations. The variation of the spectral intensity with frequency (or period) and with height is fully discussed. The conclusions drawn from this study are given at the end of the paper.

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
OBJECTIVE FORECASTING OF LOW-LEVEL WIND SHEAR, by Alfred K. Blackadar and Glenn C. Reiter. Scientific rept. no. 1 on Contract AF 19(604)2059. 31 July 58, 33p. 5 refs. AFCRC TN-58-437; AD-152 623.
Order from LC mi$3.00, ph$6.30 PB 136 761

The highest frequency of large wind shear through the lowest 300 meters occurs in the central Great Plains, where the frequency is similar in summer and winter. Elsewhere the frequency is smaller and highest in winter. After a review of the physical causes of large wind shear, an objective method of forecasting extreme values of shear at Tulsa, Oklahoma, is developed. Tests on an independent 9 month period yielded an over-all accuracy of 84 percent and a skill score of 59 percent.

Quartermaster Research and [Engineering] Center, Natick, Mass.
A GRAPHIC METHOD FOR ASSESSING HOURLY TEMPERATURE PROBABILITIES, by Earl E. Lackey. Mar 57, 18p. Technical rept. EP-46; AD-132 959.
Order from LC mi$2.70, ph$4.80 PB 127 898

The interpretation of records of weather and climate is of vital concern to Quartermaster Corps interest and activities in every area of the world where records have been accumulated and which is potentially a field of military operation. A short method assessing January hourly temperature probabilities in a high-latitude continental area is explored. (1) A summary of hourly temperatures at a given station may be achieved through frequency tabulation counts. This is an arduous time-consuming task, and the investigator must have at hand nearly all the details of the record. Rapid results are possible by means of I. B. M. methods, provided that the data have previously been assembled on I. B. M. cards, but card-punching is also time-consuming. (2) The short method explained requires only: (a) the mean daily or monthly temperature, (b) the absolute extremes, and (c) the length of the record. These data are usually given in published temperature summaries. (3) With the data at hand, a slide rule, and an adjusted probability scale, the hourly temperature probabilities for a station may be found in a few minutes. (4) As a rule, the probable hourly temperatures on the adjusted scale approximate very closely the results from the frequency tabulation. For practical purposes, the differences usually are not significant.

Quartermaster Research and Engineering Center, Natick, Mass.
SAMPLES OF CLIMATIC FREQUENCY DATA, by Sigmund J. Falkowski. Dec 58, 14p. 1 ref. Research Study rept. RER 24.
Order from LC mi$2.40, ph$3.30 PB 140 215

The purpose is to make known the availability of tabulations, to acquaint potential users with their nature and scope, and to present tentative plans for publication of the information.

Senior Observer Section, Mather AFB, Calif.
A DISCUSSION OF THE JET STREAM AND ASSOCIATED PHENOMENA RELATIVE TO HIGH ALTITUDE NAVIGATION, by Murray Ball. Staff study. 1 July 55, 11p. Proj. no. 8-55A.
Order from LC mi$2.40, ph$3.30 PB 127 631

Texas A. and M. Coll., College Station.
THREE-DIMENSIONAL DISTRIBUTION OF LAGRANGIAN DIVERGENCE FOR SELECTED CASES, by Guy A. Franceschini. Scientific rept. no. 6 on Contract AF 19(604)2222. Oct 58, 27p. 1 ref. Ref. 58-22T; AFCRC TN-58-657.
Order from LC mi$2.70, ph$4.80 PB 139 202

The three-dimensional distribution of Lagrangian divergence for selected pressure systems is presented. Computations of divergence, based on a trajectory method, were made for several pressure surfaces in each case. Vertical patterns were obtained by combining these results. A qualitative discussion is given for the five cases considered. Results agree with theoretical considerations. Implications are made on use of the trajectory method for determining Lagrangian divergence in connection with analysis and forecasting problems. A summary discussion of the contribution of divergence to pressure changes is given in an appendix. Suggestions are made regarding the consequence of the cellular nature of divergence.

Utah U., Salt Lake City.
GROUND LAYER TEMPERATURE INVERSIONS IN AN INTERIOR VALLEY AND CANYON, by Aylmer H. Thompson and Charles Ray Dickson. Final rept. on Contract DA 19-129-qm-399. 30 Aug 58, 200p. 36 refs.
Order from LC mi$8.70, ph$30.30 PB 140 349

A climatological study of the surface air layer of the Salt Lake Valley showed that inversions are frequent and important factors in the temperature structure over the valley. Radiosonde reports from the Salt Lake Airport near the center of the valley gave a fairly detailed picture of the developments of inland inversions over the valley floor, but offered no information as to the nature of the temperature structure near the rim of the valley. As an aid in correcting this deficiency, a set of stations, including a special automatic temperature recording network, was established in and near the mouth of a canyon opening into the valley from the east. Analysis of the data showed that mountain inversions formed quite rapidly and strongly as a result of pre-cooling of the surface layer in sheltered locations within the canyon. Once formed, the inversion, in the simpler cases, showed little change because adiabatic heating of the down-valley wind compensated for the radiational cooling. Dissipation occurred simply as a result of heating from below.

Travelers Insurance Co., Hartford, Conn.
STUDIES IN STATISTICAL WEATHER PREDICTION, by Thomas F. Malone. Final rept. for 30 Nov 55-14 Mar 58 on Contract AF 19(604)1590. 31 Dec 58, 238p. 48 refs. AFCRC TR-58-272.
Order from LC mi$10.20, ph$36.30 PB 140 680

This final report contains a series of individual papers describing the highlights of work carried out, at the Travelers Weather Research Center. The papers present in detail the results of the major project studies. Part I, an intensive review of certain aspects of time series analysis. Part II, Mr. Miller describes the details of screening and a procedure for its application to meteorological data. Several applications of screening appear in Part III. Part IV of this report checks (for internal consistency, etc.) performed by the computer in the data preparation, assembly, and transcription are described.

Weather Forecasting Research Center, U. of Chicago, Ill.
INVESTIGATION OF COLD WAVES AT CHICAGO, ILLINOIS, by Philbert G. Stewart. Scientific rept. no. 9 on Contract AF 19(604)2179. Mar 59, 21p. 3 refs. AFCRC TN-59-263; AD-212 970.
Order from LC mi$2.70, ph$4.80 PB 140 226

Weather Forecasting Research Center, U. of Chicago, Ill.
ON SOME WEATHER INFLUENCES DUE TO WARMING OF THE AIR BY THE GREAT LAKES IN WINTER, by S. Petterssen and P. A. Calabrese. Scientific rept. no. 7 on Contract AF 19(604)2179. Feb 59, 21p. 7 refs. AFCRC TN-59-260; AD-212 557.
Order from LC mi$2.70, ph$4.80 PB 140 227

The effect of the Great Lakes on the motion and precipitation patterns during a cold spell (February 8 - 14, 1958) is investigated. By calculating the rotational part of the motion and, also, by resolving the pressure field into orthogonal polynomials, measures of the intensity of the circulation systems associated with the Lakes were obtained. In general, the precipitation patterns caused by snow flurries from the Lakes revealed marked orographic influences. Well defined patterns, with a band of maximum precipitation about 15 - 25 miles from the shore, were found to occur persistently over the flat plains of northern Indiana and southwestern Michigan. Evidence is produced to show that these patterns are related to the nonadiabatic cooling and decrease in lapse rate of the air that moves from the open waters of Lake Michigan over the colder land.

Geodesy

Air Force Missile Test Center, Patrick AFB, Fla.
A SOLUTION TO THE GENERAL PROBLEM OF MULTIPLE STATION ANALYTICAL STEREOTRIANGULATION, by Duane C. Brown. 10 Feb 58, 56p. 12 refs. RCA Data Reduction technical rept. no. 43; AFMTC-TR-58-8; AD-134 278.
Order from LC mi$3.60, ph$9.30 PB 140 453

A rigorous least squares adjustment, believed to be of unprecedented universality, is given for the simultaneous adjustment of the entire set of observations arising from a general m-station photogrammetric net. The solution automatically considers as many as nine different kinds of control points and places no restrictions upon either the distribution of the control or upon the camera orientations. Neither are restrictions placed upon the number of exposure stations treated simultaneously or upon the elements of orientation to be considered as unknown. A complete account of the error propagation associated with the adjustment is presented.

Arctic Inst., Catholic U. of America, Washington, D. C.
PRELIMINARY KEYS FOR THE ARCTIC AND SUBARCTIC REGIONS, by Hugh O'Neill, Arthur Barwick and others. Technical rept. no. 5 on Interpretation of Vegetation from Aerial Photography, Contract N6onr-255(04). Mar 52, declassified 11 Sep 57, 195p. 22 refs. AD-140 194.
Order from LC mi$8.70, ph$30.30 PB 140 724

This report is written for the photo-interpreter, it is presumed that the person using this report will have had at least some previous training and skill in studying aerial photographs, even if he has had no other scientific training.

Oceanography

Johns Hopkins U. School of Engineering, Baltimore, Md.
AN ADVECTIVE MODEL OF THE OCEAN THERMOCLINE, by Pierre Welander. Scientific rept. no. 1 on Contract AF 19(604)2056. Dec 58, 31p. 5 refs. AFCRC-TN-58-661.
Order from LC mi$3.00, ph$6.30 PB 140 321

A theoretical study is made of the density field and the associated velocity field produced in an unlimited ocean by a prescribed density distribution at the surface. To permit a more precise check of the theory by laboratory experiments the corresponding solution is derived for a rotating "dish-pan".

Texas A. and M. Research Foundation, College Station.
THE CONFIGURATION AND SEDIMENTS OF STETSON BANK, NORTHWESTERN GULF OF MEXICO, by Andrew Conrad Neumann. Rept. on Contract N7onr-48702. Feb 58, 133p. 38 refs. Reference 58-5T.
Order from LC mi$6.90, ph$21.30 PB 140 341

Stetson Bank is a small, abrupt, elongate prominence on the continental shelf of the northwest Gulf of Mexico. Its base lies at a depth of 180 feet. The following report presents the results of a bathymetric and surface sampling program conducted during the course of three short cruises to the area in the winter and spring of 1957. Forty-six grab samples were taken from the top and sides of the bank and from the surrounding area. The bank is interpreted to be a relatively recent emplacement of sedimentary rock that has been carried to the surface by the actions of an underlying salt dome. The rocks are now exposed and protrude above the surrounding area as a result of uplift and differential erosion.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A STUDY OF PHOTOMETRIC HORIZONS PHOTOGRAPHED FROM HIGH ALTITUDE BALLOONS, by Dorrit Hoffleit. Aug 58, 90p. 5 refs. Memo rept. no. 1164.
Order from LC mi$4.80, ph$13.80 PB 140 444

Geometric and photometric analyses of photographs of the earth's horizon, obtained at high altitudes, have revealed information on atmospheric structure and, incidentally, stability of balloon-borne platforms. Measured altitudes for two bright horizontal bands observed in the horizon haze correlate closely with reported altitudes for the polar and tropical tropopauses. In addition, a horizontally striated pattern in the horizon haze indicates optical discontinuities, possibly caused by the concentrating of water vapor, ice crystals, or dust into layers. Observed positions of the prominent horizon bands have not departed from the frame of reference in most cases by more than 0.1 degree. Methods for reducing the data from the horizon camera films are described and the analysis of the results obtained to date is presented.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
NUMERICAL CALCULATIONS CONCERNING THE IONOSPHERE, by Clare Watts. Technical rept. no. 40 on Studies on Propagation in the Ionosphere, Contract DA 36-039-sc-72812. 1 Sep 57, 168p. Research rept. EE-341.
Order from LC mi$7.80, ph$25.80 PB 140 243

Primarily in connection with studies of turbulence in the ionosphere and of the effect of turbulence on the scattering of radio waves, a number of calculations of physical quantities in the ionosphere have been made. For future reference it is desired to preserve some of these calculations. The principal results have therefore been tabulated in this report together with a brief explanation of the bases of the various computations. The primary calculations (Table I) were made for a magnetic dip of $\pm 60^{o}$. In subsequent tables modifications were made appropriate to other magnetic dips (0^{o}, $\pm 30^{o}$, $\pm 75^{o}$, $\pm 85^{o}$, 90^{o}).

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
VHF RADAR ECHOES ASSOCIATED WITH ATMOSPHERIC PHENOMENA, by G.-C. Rumi. Technical rept. no. 34 on Studies on Propagation in the Ionosphere, Contract DA 36-039-sc-56748. 25 May 56, 79p. 51 refs. Research rept. EE 288.
Order from LC mi$4.50, ph$12.30 PB 127 741

VHF radar observations during the summer and fall of 1955 at Ithaca, New York, gave us useful information, not only about lightning, meteors, and aurora, but also about the existence and the characteristics of "upward discharges" leaving the top of the troposphere and moving toward the ionosphere. Two radars were used for the present research. A special feature was the photographing from magnetic tape records that were played back to reproduce the original oscilloscope presentation. Photographs are presented that show examples of two main groups of echoes in their amplitude-versus-time display. The discussion and interpretation of the lightning echoes led us to conclude that we had records of discharges within a thundercloud. The second group of echoes were similar to meteor echoes, but their characteristics made it incorrect to attribute them to meteors. The inconsistencies with meteor echoes were confirmed by a synthetic approach as well as by analysis. The idea of upward discharges was deduced on the basis of discreteness, speeds, duration, flatness of the tops, decay behavior, ranges, and repetition. An essential difference between the ionized column produced by a meteor and the ionized channel caused by an upward discharge is the curvature. Some evidence to show that meteors may play a role in the generation of upward discharges, probably as the triggering agent, appears in our records.

Hawaii Inst. of Geophysics, Honolulu.
ABSORPTION CROSS SECTION OF O_2, NO, AND NO_2 WITH AN IMPROVED PHOTOELECTRIC METHOD, by K. Watanabe, H. Sakai and others. Scientific rept. no. 4 on Contract AF 19(604)1390. Dec 58, 42p. 38 refs. Contribution no. 11; AFCRC TN-58-[658].
Order from LC mi$3.30, ph$7.80 PB 139 221

Resolutions of 0.1 and 0.2 A in the vacuum ultraviolet were obtained with a 1-meter monochromator using a grating ruled with 1200 lines per mm and an EMI photomultiplier coated with sodium salicylate as a detector. This apparatus was employed for measurements of absorption cross section of O_2, NO, and NO_2.

Institute of Mathematical Sciences, New York U., N. Y.
ON THE CONVERGENCE OF THE NUMERICAL SOLUTION FOR A CERTAIN PARTIAL DIFFERENTIAL EQUATION OF THIRD ORDER, by Halina Montvila. Rept. on Contracts Nonr-285(06) and AF 19(604)2265. Sep 58, 75p. 8 refs. IMM-NYU-256; AFCRC TN-58-494.
Order from LC mi$4.50, ph$12.30 PB 140 451

Ionosphere Research Lab., Pennsylvania State U., University Park.
EXPERIMENT FOR ELECTRON DENSITY DETERMINATION BY A ROCKET METHOD, AND GROUND-BASED INSTRUMENTATION DESIGN, by E. A. Mechtly. Scientific rept. no. 107 on Ionospheric Research, Contract DA 36-061-ORD-577. 25 July 58, 85p. 51 refs.
Order from LC mi$4.80, ph$13.80 PB 136 834

Current knowledge of the ionosphere and exosphere is reviewed with particular attention given to the problem of electron density determination. Several rocket experiments designed to measure electron densities are outlined. Theoretical considerations and ground based instrumentation development related to this experiment are discussed in detail. Plans for rocket launchings and further studies in conjunction with this experiment are presented.

Kansas U., Lawrence.
INVESTIGATION OF COMPETITIVE GAS-PHASE REACTIONS OF RECOILING TRITIUM ATOMS, by F. S. Rowland. Progress rept. nos. 1 and 2 on Contract AF 19(604)4053. [1958] 6p. 5 refs.
Order from LC mi$1.80, ph$1.80 PB 140 740

The investigation of the gas-phase reactions of recoiling tritium atoms has followed three separate approaches, each relating to the hypothesis that the chemical state of cosmic-ray produced tritium is determined by "hot" reactions of the recoil tritium atom before the atom can be thermalized. These lines of approach are the following: (1) Calculations of the probabilities for reaction in terms of the known concentrations of molecular species in the atmosphere, and reasonable hypotheses for the altitude of tritium production; (2) experimental measurements of the location of tritium activity in gas mixtures of O_2, H_2O, H_2, A, and He. and (3) investigating the HT/HTO ratio in aqueous solutions of 1% $LiNO_3$ at various pH's.

Lansdale Tube Co. [Pa.]
A DETECTION SYSTEM FOR OZONE-EMPLOYING POLYELECTROLYTE FILMS, by Jack M. Hirshon. Final technical rept. on Contract AF 33(600)35218. May 58, 53p. 45 refs. WADC Technical rept. 58-50; AD-155 667.
Order from LC mi$3.60, ph$9.30 PB 140 792

A chemical film system for the detection and measurement of atmospheric ozone has been shown to be feasible. This system is based on the oxidizing power of ozone to produce ions in an otherwise essentially nonconducting system. The conductivity is then a measure of the oxidation reaction and hence the ozone concentration under suitable experimental conditions. Another system based on the change in potential of a suitable redox electrode has been shown to respond to ozone. The sensitivity and time response characteristics of both these systems still require additional development work before an ozone-sensitive film can be incorporated into a complete instrument.

Michigan U. Research Inst., Ann Arbor.
THE EXOS SOUNDING ROCKET, by W. H. Hansen and F. F. Fischbach. Final rept. on Contract AF 19(604)1943. Dec 58, 53p. 5 refs. 2595-1-F; AFCRC TR-59-216; AD-210 617.
Order from LC mi$3.60, ph$9.30 PB 140 633

The Exos sounding rocket was developed to fill the needs of upper-air research for an economical vehicle carrying a 40-lb payload to a 300-mile altitude. The report describes the Exos in detail and gives the results of the first two flight tests. The major part of the report is devoted to a manual-type description of the assembly procedures. Part lists and procurement information are included.

Michigan U. Research Inst., Ann Arbor.
THEORETICAL CONSIDERATIONS IN DESIGN OF AN IONOSPHERIC PROBE, by R. L. Boggess. Scientific rept. no. FS-2 on Contracts DA 20-018-509-ORD-103 and AF 19(604)1843. Feb 59, 45p. 14 refs. 2816:1-2-S, 2521; AFCRC TN-59-251; AD-211 927.
Order from LC mi$3.30, ph$7.80 PB 140 640

The general theory of a Langmuir probe is reviewed and extended with emphasis on spherical geometry. Numerical and graphical methods are provided for calculating the volt-ampere characteristics of a bipolar probe. The volt-ampere characteristics of three electrode combinations are illustrated. A brief discussion of the practical and theoretical considerations which led to the choice of a particular configuration is included.

Puerto Rico U. Coll. of Agriculture and Mechanic Arts, Mayaguez.
IONOSPHERIC DRIFTS IN PUERTO RICO OBTAINED BY THE METHOD OF ANALYSIS DEVELOPED IN NEUF-BREISACH, by E. Harnischmacher. Scientific rept. no. 5 on Study of Ionospheric Winds, Contract AF 19(604)2036. Dec 58, 32p. 1 ref. AFCRC-TN-59-218.
Order from LC mi$3.00, ph$6.30 PB 140 320

The method of similar fades for determination of ionospheric drifts with spaced receivers is first discussed together with modifications and simplifications in the calculating procedure introduced at Neuf Breisach. The records used and their analysis according to this method are then discussed. The results are then set forth together with comments on certain regularities observed in the ionospheric drifts.

ENGINEERING

Aeronautical Engineering

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
EXPERIMENTAL AND ANALYTIC STUDY OF THE DUCTED FAN AND FAN-IN-WING IN HOVERING AND FORWARD FLIGHT, by Herbert H. Moser and Charles L. Livingston. Rept. on Contract DA 44-177-TC-486. Jan 59, 122p. 16 refs. Technical rept. 79-1; AD-201 398.
Order from LC mi$6.30, ph$19.80 PB 140 270

Two ducted fan models have been constructed and tested in hovering and in a wind tunnel. One model is a simple ducted fan such as might be used in tilting forward flight. The other model is a ducted fan buried in a wing with the fan axis normal to the chord plane of the wing. Hovering tests indicated that existing theory is not wholly adequate due to the severe three-dimensional effects associated with finite blade tip clearance. Force and pressure measurement data demonstrate the mechanism of the neutral ground effect of the tilting model and the moderately negative ground effect of the wing model. Shroud length tests indicate that the static efficiency of the ducted fan improves with increased shroud length. Some evidence is found to support the proposition that, in certain cases, the flow may be over-developed at the shroud exit. Wind tunnel data for the tilting model is tabulated and analyzed. The equilibrium flight charac-

teristics of the tilting model are established and compared with those of other models and test beds.

Almay Research and Testing Corp., Los Angeles, Calif.
STUDY AND INVESTIGATION OF FASTENERS FABRICATED OF TITANIUM AND TITANIUM ALLOYS, by Perry Goldberg. Rept. on Phase I of Contract NOas 57-817-c. 30 Dec 57, 48p. 30 refs. Rept. no. G8000.
Order from LC mi$3.30, ph$7.80 PB 140 166

Prime factor in employing titanium alloy fasteners is the favorable strength/weight ratio when compared with comparable type alloy steel fasteners. Attention should be directed at lowering costs of finished products so that price advantage can match or approximate strength/weight advantage.

Armour Research Foundation, Chicago, Ill.
AIRCRAFT LANDING GEAR BRAKE FRICTION MATERIALS DEVELOPMENT. Final rept. for 28 May 52-31 July 57 on Contract AF 33(616)186. July 57, 196p. 87 refs.
Order from LC mi$8.70, ph$30.30 PB 138 140

The objective of this program was to survey the literature on the subject, the aircraft brake industry, and then to develop new improved brake linings and mating member alloys able to sustain high energy stop conditions. Titanium and molybdenum reinforced linings were found to be very promising and are recommended for further development. The alloys capable of withstanding severe braking conditions were 30% molybdenum-70% titanium and 50% titanium-50% vanadium. Molybdenum also showed promise as being very valuable in future brake development either alone or alloyed. Metal fiber reinforcement of metal-ceramic linings contributed considerably to the strength of the new materials.

Armour Research Foundation, Chicago, Ill.
STUDY OF LIMITED TYPE ICE REMOVAL AND PREVENTION SYSTEMS--CHEMICAL PHASE, by R. A. Budenholzer, F. J. Olmer, and T. E. Waterman. Rept. for 15 May 54-14 May 55 on Contract AF 33(616) 2496. June 55 [143]p. 31 refs. WADC Technical rept. 55-261; AD-118 662.
Order from OTS $2.75 PB 151 293

Various chemical and thermo-chemical methods of protecting aircraft against icing were investigated for four basic systems; namely; initial, one shot, limited duration and partial. For initial systems the most promising methods appear to be those using externally applied solid or highly viscous freezing point depressant solutions such as; a solution of 25 percent sodium dispersed in high molecular weight polymerized glycols, lithium chloride dispersions in polymerized glycols, or lithium chloride plus alginate gel mixtures. For one shot systems the following were found to have merit; utilization of internally stored liquid freezing point depressants; utilization of delayed chemical action; and methods using heat. For limited duration systems most of the above mentioned would be suitable. For partial systems, upper surfaces near the leading edge of wings should receive top priority for anti-icing because of the high drag penalty associated with ice accumulation in these regions. For most systems it is more efficient to prevent the formation of ice, rather than to allow it to collect before removal.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
STUDY OF HELICOPTER MAIN ROTOR BLADE REMOVALS, by Dean E. Wright. Nov 58, 19p. Proj. 9-38-01-000; AD-205 367.
Order from LC mi$2.40, ph$3.30 PB 140 563

The purpose of this study was to determine the causes of rotor blade failures prior to the expiration of their prescribed service life. Records maintained on the number of main rotor blades requisitioned and the number of flight hours accumulated by each helicopter model were reviewed. The results of the study indicate that the greatest percent of rotor blade removals was attributed to operational damage, and that only a small percent was attributed to manufacturing defects.

Arnold Engineering Development Center, Tullahoma, Tenn.
DEVELOPMENT OF THE SPARK-HEATED HYPERVELOCITY, BLOWDOWN TUNNEL-HOTSHOT, by R. W. Perry and W. N. MacDermott. Rept. on Contract no. AF 40(600)700. June 58, 102p. 27 refs. AEDC-TR-58-6; AD-157 138.
Order from LC mi$5.70, ph$16.80 PB 140 721

A new type of wind tunnel (called "Hotshot") capable of producing the true relative velocities of hypersonic flight has been developed. The required high stagnation enthalpies are obtained by heating a confined mass of air with a powerful electrical discharge from a large condenser bank. The resulting hot air is expanded in a Laval nozzle and produces hypersonic flow for a period of up to 50 milliseconds. Operation of the original 16-inch Hotshot tunnel with reservoir temperatures of 4000°K to 8000°K (7200°R to 14,400°R) and reservoir pressures of 15,000 psi to 20,000 psi has been reduced to routine practice. Also, a family of instrumentation techniques has been developed which permits conventional pressure, heat transfer, and force tests to be made in the tunnel. Development-type tests of components of a number of missiles have been conducted in the Mach number range of 11 to 20 and at equivalent density altitudes of 140,000 ft to 200,000 ft.

Battelle Memorial Inst., Columbus, Ohio.
THE INERTIAL IMPACTION OF SMALL PARTICLES by M. N. Golovin and A. A. Putnam. Rept. on Contract AF 40(600)710. June 58, 96p. 58 refs. AEDC-TN-58-36; AD-157 135.
Order from LC mi$5.40, ph$15.30 PB 140 297

The inertial deposition of small gas-borne particles onto the surfaces of obstacles placed in a flowing gas stream has been analyzed with the aid of a review of the pertinent experimental data found in the literature. The specific application considered is the expected deposition of 1 to 5-micron boron oxide particles onto

elements of a heat exchanger in the exhaust system of an altitude-simulating aircraft-engine test facility.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
SUMMARY OF INSTRUMENTATION DEVELOPMENT AND AERODYNAMIC RESEARCH IN A HYPERSONIC SHOCK TUNNEL. PART II. NOZZLE FLOW STUDY AND FLOW ANGULARITY MEASUREMENTS, by Charles E. Wittliff and Merle R. Wilson. Rept. for Dec 57-Oct 58 on Contract AF 33(616)2387. Dec 58, 27p. 12 refs. WADC Technical rept. 58-401, Part 2; AD-207 615.
Order from OTS $0.75 PB 151 742

In order to reduce the nonuniformity of the flow in the test section of the C. A. L. Tailored-Interface Hypersonic Shock Tunnel, a nozzle design study has been conducted which has led to the fabrication of new terminal nozzle blocks. Studies have been made of two nozzle designs: one is a contoured nozzle capable of producing Mach 8 parallel flow, the other is a 15° wedge-type nozzle which would produce a source flow. While non-uniformities -- stemming from the radial nature of the flow -- are inherent in a wedge-type nozzle, they were considered small enough so that the 15° wedge nozzle, which is easily adaptable to different Mach numbers, was selected for fabrication in preference to the more expensive and less flexible contoured nozzle. The results of flow angularity and static and pitot pressure measurements in this nozzle are presented as evidence of the improved flow quality. Although the new nozzle has some angularity in the vertical plane, the angularity in the horizontal plane is small enough to permit angle-of-attack tests in that plane.

David Taylor Model Basin, Washington, D. C.
PRELIMINARY STUDY OF THE HOVERING PERFORMANCE OF ANNULAR JET VEHICLES IN PROXIMITY TO THE GROUND, by Harvey Chaplin and Bertrand Stephenson. Aug 58, 28p. 4 refs. Aero rept. 947.
Order from LC mi$2.70, ph$4.80 PB 136 570

An approximate theoretical method of estimating power required for an annular jet vehicle with near-optimum nozzle geometry is derived. Charts showing the approximate relations between size, altitude, gross weight and power are developed by this method. These charts are used as the basis for a preliminary structural feasibility and weight study. An approximate optimum size-power relationship for vehicles operating at fifteen feet altitude for thirty hours is derived, and the variation of payload with size is estimated. The results indicate that in small sizes, about 100 feet in diameter or less, the vehicles tend to become flying power plants with little load-carrying capacity; but, as the size is increased, the empty and fuel weights become proportionately smaller parts of the gross weight, allowing greater potential payload and range.

Fluidyne Engineering Corp., Minneapolis, Minn.
GUST ALLEVIATION STUDY. PART II. WIND TUNNEL DETERMINATION OF SPOILER AND FLAP EFFECTIVENESS, by Douglas C. Nichols. Rept. for July 53-Oct 56 on Engineering Analysis of Wing Installed Aerodynamic Devices for Gust Alleviation, Contract AF 33(616)2094. Jan 58, 89p. WADC Technical rept. 57-750, Pt. 2; AD-208 144.
Order from OTS $2.25 PB 151 755

This is the second part of a three part report presenting the results of an investigation made to determine the feasibility of using wing installed aerodynamic devices for gust alleviation. This part presents the results of wind tunnel tests made to determine the aerodynamics effectiveness of several spoiler and flap configurations. The data obtained are presented in coefficient form without analysis. Comparisons between the control effectiveness determined by these tests and the control effectiveness predicted by Part I of this report are shown in Part I. (See also PB 151 710)

Kaman Aircraft Corp., Bloomfield, Conn.
KAMAN K-17 COLD PRESSURE JET RESEARCH VEHICLE, by George F. Lubben, Charles W. Ellis, and John O. Emmerson. Final technical rept. on Contract DA 44-177-TC-413. 25 Aug 58, 138p. 8 refs. Rept. no. G-115; AD-203 481.
Order from LC mi$6.90, ph$21.30 PB 140 343

This is a technical report covering the compressor-in-fuselage configuration and the compressor-in-head configuration as built and tested separately and comparatively by this contractor.

Marathon Electric Mfg. Corp., Wausau, Wis.
DESIGN STUDY, POWER SUPPLY, ALTERNATING CURRENT, WITH ADJUSTABLE CHARACTERISTICS, by Stanley S. Burns. Rept. on Contract AF(616)3724. Mar 59, 131p. WADC Technical note 59-75; AD-211 774.
Order from OTS $2.75 PB 151 777

The design of a power supply system which will produce any frequency between 380-420 cps, and which is capable of providing variations in voltage modulation, voltage regulation, frequency modulation and wave form over a wide range for both steady state and transient conditions is described and discussed. During the developmental stages of aircraft utilization equipment at the present time no suitable means exists for determining how this equipment will function when it is energized by contemporary aircraft power supply systems. By the use of the adjustable power supply the maximum variations encountered in the operation of these aircraft power supplies may be applied at will to the utilization equipment during the early development period. By these means, expensive re-design at a later date will be eliminated. Furthermore, the entire aircraft electrical system and the associated utilization equipment may be designed to function as a unified whole. In addition, much of the utilization equipment which now requires more closely regulated power than that which is supplied by the aircraft primary electrical system, may be designed to function properly on this primary system, thereby eliminating the necessity of special voltage and frequency regulators which may be parasitical on the electrical system.

Metcut Research Associates, Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS. PHASE I. SURVEY OF EXISTING INFORMATION; ISOLATION OF PROBLEMS, by Leonard J. Nowikowski and William P. Koster. Rept. for 22 Dec 57-10 Feb 58 on Contract AF 33(600)35967. 28 Feb 58, 157p. Wright Aeronautical Serial rept. no. MP. 00-159.
Order from OTS $3.00 PB 151 774

The purpose is to investigate and evaluate the machining characteristics of high strength, thermal resistant materials on which present aircraft design and future construction is based. Phase I comprises an industrial and a literature survey designed to ascertain the types of parts intended for future aircraft, the alloys to be used for these parts, and the machining problems associated with their manufacture.

Michigan U. Research Inst., Ann Arbor.
ON AXISYMMETRIC VIBRATIONS OF THIN SHALLOW VISCOELASTIC SPHERICAL SHELLS, by P. M. Naghdi (U. of Calif.) and W. C. Orthwein (International Business Machines Corp.). Technical note no. 5 on Contract AF 18(603)47. Jan 59, 31p. 15 refs. 2500-6-T; AFOSR TN-59-109; AD-210 389.
Order from LC mi$3.00, ph$6.30 PB 140 239

This paper is concerned with transverse vibrations of shallow viscoelastic spherical shells subjected to axisymmetric loads which are harmonic in time. In particular, the steady state solution is obtained for an unlimited viscoelastic shallow shell subjected to an oscillating load uniformly distributed over a small circular region about the apex. Numerical results for axial displacement and stresses are obtained for two special viscoelastic media (Maxwell and Kelvin) as well as for the elastic shell, and comparison is made with known results.

Naval Air Test Center, Patuxent River, Md.
EVALUATION OF SELF ORIENTING CHANNEL LIGHT SUPPORT PROTOTYPE, by H. Mann. Rept. no. 1 (Final) on Proj. TED no. PTR AE 10028. 14 July 58, 19p. 6 refs. Serial ET311-229.
Order from LC mi$2.40, ph$3.30 PB 140 266

The purpose of this project was to service test two self-orienting channel light supports mounted on different (one metal and one concrete) leveling bases. The supports were designed for use in seadrome approach and landing lanes to provide for installations of high-intensity directional lighting that will not present a hazard to seaplanes. Observations were to be made on accuracy of the device, possible design improvements, durability of materials and general suitability.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
SUPERSONIC WIND TUNNEL TESTS OF RING-WING CONFIGURATIONS, by Leon H. Schindel. Rept. on Contract AF 33(616)3975. Dec 58, 108p. 29 refs. WADC Technical rept. 58-220; AD-155 534.
Order from OTS $2.50 PB 151 754

Supersonic wind tunnel measurements have been made of aerodynamic forces and moments on ring-wing configurations. The main result indicates that the combination of linearized and slender body theory is not adequate to design a ring-wing vehicle so as to cancel the wave drag. Other tests provide data on tandem ring-wings and on the lifting effectiveness of support struts. In addition, some experimental results are reported on the area ratio required to start supersonic flow in the annular region between the wing and the body. Although no new contributions are offered to the body of ring-wing theory, an extensive review of the present state of its development is included in this report.

New York U. Coll. of Engineering, N. Y.
ORIENTATION OF RESEARCH NEEDS ASSOCIATED WITH ENVIRONMENT OF CLOSED SPACES, by William T. Ingram. Rept. on Contract AF 18(603)71. [1958] 21p. 18 refs. AFOSR TN-58-106; AD-152 015.
Order from LC mi$2.70, ph$4.80 PB 140 423

A study of closed ecological systems and the engineering techniques requisite to the handling, treatment, and disposal or recycling of materials appearing as wastes and by-products of human occupancy of the closed space.

Polytechnic Inst. of Brooklyn, N. Y.
THE ELASTICITY SOLUTION OF A LONG CIRCULAR CYLINDRICAL SHELL SUBJECTED TO A UNIFORM CIRCUMFERENTIAL RADIAL LINE LOAD, by Jerome M. Klosner and Frederick V. Pohle. Rept. for 1 Mar 56-31 July 57 on Contract DA 30-069-ORD-1723. July 57, 53p. 11 refs. PIBAL rept. no. 416; WAL-893/205-1.
Order from LC mi$3.60, ph$9.30 PB 140 196

The problem of a long circular cylindrical shell subject to a uniform circumferential radial line load is solved using the three-dimensional equations of elasticity. The elasticity solution is then compared with the Flügge and Timoshenko shell-theory solutions for the case $b/a = 0.9$, $\nu = 0.3$.

Polytechnic Inst. of Brooklyn, N. Y.
PRESSURE DISTRIBUTION ON DIHEDRAL WINGS AT SUPERSONIC SPEED, by Lu Ting. Rept. on Contract AF 18(600)694. Jan 58, 62p. 11 refs. PIBAL rept. no. 397; AFOSR TN-58-86; AD-148 135.
Order from LC mi$3.90, ph$10.80 PB 140 454

Polytechnic Inst. of Brooklyn, N. Y.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF A COWLING AS A MEANS OF DRAG REDUCTION FOR AN AXISYMMETRIC CENTER BODY, by Marian Visich, Jr. and Anthony Martellucci. Rept. on Contract AF 49(638)217. Aug 58, 39p. 13 refs. PIBAL rept. no. 451; AFOSR TN-58-760; AD-162 273.
Order from LC mi$3.00, ph$6.30 PB 140 458

A theoretical and experimental investigation at a Mach number of 3.09 of an axisymmetric boat-tailed center body surrounded by a cowling ring has been conducted. The design of the body was accomplished

by the method of characteristics for axisymmetric irrotational flow for zero angle of attack. The test Reynolds number per foot for the entire program was 3.37×10^7 and the flight altitude for the test was at zero angle of attack. The method of design, a description of the experimental equipment, discussion of the test results and the possible applications of the system are presented in this report.

Princeton U., N. J.
DESIGN STUDY OF A MODIFIED HIGH LIFT AND LATERAL CONTROL SYSTEM FOR THE L-21 AIRPLANE, by W. S. Childress. Rept. on Contract Nonr-1858(14). July 58, 27p. 12 refs. Aeronautical Engineering rept. no. 422.
Order from LC mi$2.70, ph$4.80 PB 140 510

Consideration is given to spoiler type lateral controls as a means of utilizing full span flaps. An air jet spiiler is described which eliminates some of the response problems associated with mechanical spoilers, as well as a high lift system utilizing this device in conjunction with moderate BLC equipment. Preliminary calculations are carried out for this system applied to the L-21 (PA-18) aircraft. For boundary layer blowing over the inboard flap ($C_{\mu_{BLC}} = .03$) and simultaneous application of full spoiler ($Pb/2v = .07$), the power supply is found to be adequate as an air source. The modified aircraft has a calculated $C_{L_{max}}$ of 2.98 under power using the stock engine, and requires additional longitudinal trim during landing sufficient to change the effective incidence of the tail -11.5^o.

Rome Air Development Center, Griffiss AFB, N. Y.
QUICK-FIX RECOMMENDATIONS FOR REDUCTION OF JET ENGINE NOISE IN AIR FORCE CONTROL TOWERS, by R. J. Christman and L. R. Pinneo. Dec 57, 21p. 5 refs. RADC TR-57-189; AD-131 374.
Order from LC mi$2.70, ph$4.80 PB 140 208

This report presents several techniques which may be employed by local AACS units, in conjunction with their respective Air Installation organizations, for the reduction of jet engine noise in air control towers. Suggestions present minor changes or additions to towers to provide a "quick-fix" relief without the need for immediate tower replacement of major construction.

Wichita U. School of Engineering, Kans.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A SHROUDED PROPELLER WITH A 17-BLADED ROTOR, INLET AND EXIT STATORS, AND LONG SHROUD WITH HIGH-SPEED INLET AND NO EXIT DIFFUSION, by Vernon O. Hoehne and Robert K. Wattson, Jr. Rept. on Contract Nonr-201(01). June 58, 69p. 10 refs. Engineering rept. no. 213-1.
Order from LC mi$3.90, ph$10.80 PB 140 348

A shrouded propeller unit with 18 adjustable inlet guide vanes, 17 propeller blades, and 19 exit stator vanes, equipped with a shroud of 0.687 chord/diameter ratio, was tested in the Walter H. Beech Memorial Wind Tunnel. A shroud inlet designed for high-speed operation, and a shroud afterbody with no diffusion, were used. Performance parameters were obtained for a range of external advance ratios from static to 5.18, at angles of attack from zero to 30^o, and with various inlet vane settings. Results are presented in the form of thrust, power and moment coefficients, and propulsion efficiencies.

Chemical Engineering

Army Chemical Warfare Labs., Army Chemical Center, Md.
SPRAY DISSEMINATION OF AGENTS. Rept. of Symposium 8, vol. 1, 4-6 Mar 58. July 58, 153p. CWL Special Publication 2.
Order from OTS $3.00 PB 151 528

A series of 24 papers on concepts and designs of spray dissemination and systems. The properties and behaviors of the sprayed liquids are discussed as well as test techniques. This symposium has not been scheduled for publication generally.

Bureau of Yards and Docks, Washington, D. C.
ABC WARFARE DEFENSE MATERIEL INSPECTION AND STORAGE. 7 Jan 59, 88p. Technical pub. NAVDOCKS TP-PL-19; BUDOCKSINST 3440.4.
Order from LC mi$4.80, ph$13.80 PB 140 333

The purpose of this publication is to provide general instructions for determining the serviceability of atomic, biological, and chemical warfare defense material and equipment under the cognizance of the Bureau of Yards and Docks. The complete method for evaluating the serviceability of each item is indicated in these instructions.

George Washington U., Washington, D. C.
FUNGICIDES FOR PREVENTING TROPICAL DETERIORATION. Rept. no. 8 on Contract OEMsr-1356. Jan 45, declassified 10 Sep 58. 32p. 47 refs. AD-201 821.
Order from LC mi$3.00, ph$6.30 PB 140 335

In this report, various properties are tabulated of most of the more important fungicides recommended or suggested for the protection of materials against tropical deterioration. A list of abbreviations used in the tables and a list of references are included.

Johnson and Johnson, New Brunswick, N. J.
DEVELOPMENT OF PRODUCTION TYPE INJECTION MOLDS TO PRODUCE THE E52 CIVILIAN PROTECTIVE MASK IN SIX SIZES, by Richard F. Schenk. Final rept. on Contract DA 18-108-cml-4097. Aug 57, 227p.
Order from LC mi$9.90, ph$34.80 PB 140 542

This report is a detailed summary of the work of the contractor over a six-year period in an effort to develop a practical, economical method of producing a low-cost protective face mask. Explanations of many satisfactory, as well as unsatisfactory production

techniques are presented, and emphasis is placed on the details of the method finally found acceptable. As each technique is explained, further possible avenues of additional development are outlined. The technique used in developing the sizes of the six masks is reported in the appendix of the report as well as design drawings for the six masks. Numerous illustrations have been included, as well as detailed explanations of each one. Assembly drawings of molds for each size mask, a process flow chart, and some vital tooling is also included. Upon delivery of 1,200 completed masks, this report was submitted as a successful conclusion to this project.

Office of Scientific Research and Development. Div. 10.
ADSORPTION AND SURFACE AREA MEASUREMENTS ON WHETLERITES AND CHARCOAL SAMPLES, by P. H. Emmett, James Holmes and others (Johns Hopkins U.). Formal rept. (Final) for 15 May 43-15 Nov 44 on Contract NDCrc-119. 30 May 45, declassified 26 Mar 59. 153p. OSRD no. 5065; ATI-32 801.
Order from LC mi$7.50, ph$24.30 PB 140 090

The scope of the study upon the factors in the structure of molecules which determine their relative adsorbabilities on a given charcoal has been increased to contain nearly double the number of materials. The theoretical development is still incomplete but the qualitative results are unchanged from those reported previously, namely that all molecules having a strong dipole moment in any H-R bond (where R is any organic or inorganic group) are less strongly adsorbed at low relative pressures than those without such a group. A number of new samples have been examined in regard to their adsorption of water vapor and additional emphasis has been placed upon the influence of surface conditions upon the actual shape of the water isotherm. Isotherms conducted under static as well as flow conditions were made for the adsorption of pyridine and 4-picoline upon a number of different base charcoals and whetlerites. The results indicate that these materials were strongly adsorbed in every case. A brief review of the Pearson gage and mercury penetration procedures for determining pore size and pore size distribution of pores in excess of 1800 Å in diameter is given. Rate measurements for the adsorption of carbon tetrachloride upon CWSN S5, CWSN 19, CWSN 196 BIX, and CWSN 196 BIX TH410 (base char 196 BIX heated 10 hours at 1100°C in nitrogen) indicate that at 0.036 relative pressure of carbon tetrachloride there was no marked difference whether the runs were carried out at 20°C or 25°C upon either the apparent saturation values or the times to reach half saturation. On the basis of comparison between nitrogen isotherms for many base charcoals and the activities of their respective whetlerites towards CC under 80/80 conditions it was felt that materials having pore structures similar to the PCI type of charcoal as judged by nitrogen isotherms would be most desirable. Since aging of whetlerites under 80/80 moisture conditions is accompanied by a removal of oxygen from the surrounding atmosphere, an attempt has been made to produce charcoals in which the normal oxygen containing surface complex has been replaced by some other type of complex. An extensive study of the nature and properties of the complexes contained upon various charcoals under different conditions of aging and treatment was made by means of high temperature evacuation of the samples and analyses of the gases evolved over 300° temperature intervals up to 1200°C.

Olin Mathieson Chemical Corp., East Alton, Ill.
RESEARCH AND DEVELOPMENT OF FLAMMABLE PLASTIC FOR COLORED SMOKE, by N. J. Wilkaitis. Final rept. for 1 Jan-30 Sep 56 on Contract DA 18-108-cml-5920. 30 Oct 56, 50p. 3 refs.
Order from LC mi$3.30, ph$7.80 PB 136 691

A study of plastic binders for use in colored smoke mixtures has shown that polyvinyl acetate, incorporated with a volatile solvent, is suitable for use in either red, yellow or green smoke mixtures. Acceptable red, yellow and green formulations, containing polyvinyl acetate as the binder, were developed. The minimum possible amount of plastic was used in each formulation. This was 4% in the red and green formulations and 6.5% in the yellow formulation. Since the yellow formulation does not contain sulfur, it is comparable in sensitivity to the red and green formulations. Green formulations were extruded through a Starrett Extruder. Satisfactory results were obtained with consistencies varying from a thin paste to a heavy moldable mass. Cyclic temperature surveillance (from -60° to +160°F.) of formulations developed under Phase I was completed. Production of a total of 507 red, yellow and green smoke munitions was completed.

Purdue U., Lafayette, Ind.
MODIFIED URRY TOEPLER PUMP, by F. Vratny and B. Graves. Rept. on Contract AF 18(603)45. 22 Apr 59, 5p. AFOSR TN-59-302; AD-213 086.
Order from LC mi$1.80, ph$1.80 PB 140 536

Details are given on various modifications which would enable pump to be used properly at 0-5 cm Hg.

Richmond Research Lab., Stauffer Chemical Co., Calif.
INORGANIC POLYMERS PROGRAM, by P. Barna, F. O. Groch and others. Semi-annual technical rept. for 1 Jan-1 July 58 on Contract Nonr-2259(00). July 58, 48p. 8 refs.
Order from LC mi$3.30, ph$7.80 PB 140 479

The physical properties of the polymers prepared from the reaction of diborane and various alkylene phosphines have been investigated and it was concluded that they are not stable enough to be useful. An isotope study was made of the reaction between $NaPH_2$ and R_f-I in two solvents and a mechanism has been proposed. The investigation of the preparation and reaction of silyl phosphines is continuing. The preparation of cyclic perfluoroglutaroimidine has been investigated and the stability of this monomer examined. Sufficient quantities have been prepared to allow study of the preparation of the copolymer with perfluorobutyroamidine. Similar but less extensive work with perfluoroadipodiamidine has resulted in satisfactory polymers.

Civil Engineering

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
STUDIES OF AERIAL CONE PENETROMETER: FIELD TESTS. Apr 58, 36p. Technical rept. no. 3-462, rept. 2.
Order from LC mi$3.00, ph$6.30 PB 136 140

Thirty-nine tests with the aerial cone penetrometer shot or dropped at 100-fps velocity in four wet fine-grained soils revealed that the penetrometer caused some softening or remolding of the soil in its immediate vicinity. Curves of penetration of the aerial cone penetrometer vs rating cone index (the measure of trafficability) appeared to be valid, indicating that the aerial penetrometer shows promise as an instrument for remotely measuring soil trafficability.

Bureau of Yards and Docks, Washington, D. C.
MAINTENANCE MANAGEMENT OF PUBLIC WORKS AND PUBLIC UTILITIES. 27 Nov 56, 217p. Technical pub. NAVDOCKS TP-Pw-33; BUDOCKSINST 11014.15A and Changes 1 & 2.
Order from LC mi$9.60, ph$33.30 PB 140 331

This publication has been prepared as an aid for naval and civilian personnel concerned with the maintenance management of public works and public utilities at shore activities of the Naval Establishment. Controlled Maintenance, as outlined in this publication, is the application of proven management and industrial engineering principles to the maintenance and operation of public works and public utilities. The significance of Controlled Maintenance is explained, as are the basic concepts, elements of control, and extent of control. Also included are procedures and other criteria to assist in the implementation of Controlled Maintenance.

Bureau of Yards and Docks, Washington, D. C.
NATURAL DISASTERS: EFFECTS AND ENGINEERING CONTROL MEASURES. INTERIM EDITION, 1 Sep 56, 55p. 1 ref. Technical pub. NAVDOCKS TP-PL-18; BUDOCKSINST 11090.1
Order from LC mi$3.60, ph$9.30 PB 140 543

This publication has been prepared to provide technical information and guidance for naval personnel concerned with defense and recovery measures taken to minimize the damage that might result from natural disasters at naval shore activities. It is concerned primarily with the physical means of reducing the damaging effects of such natural disasters as hurricanes, tornadoes, tidal waves, earthquakes, and floods. Various types and effects of natural disasters are discussed herein with special emphasis on the vulnerability of, and effects on, areas, structures, communications utilities, and transportation facilities of naval activities. Physical measures and engineering controls that have been effective in curtailing or reducing damage caused by natural disasters are covered.

Bureau of Yards and Docks, Washington, D. C.
STORM DRAINAGE SYSTEMS. Rev. Dec 56, changed 22 Oct 57. 83p. Technical pub. NAVDOCKS TP-Pw-1; BUDOCKSINST 11340.1A and 11340.1A CH 1.
Order from OTS $2.25 PB 151 694

The storm drainage system at every naval shore activity must be designed to afford maximum protection for installations that are vital to national defense. The system should prevent, or at least minimize, damage that may occur when exceptionally heavy storms exceed the capacity of the collection and disposal system. Some new criteria are presented, particularly those dealing with new types of pipe that have been developed. New methods and revised data for facilitating solution of drainage problems also are presented.

Electrical and Electronic Engineering

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
FIN TECHNOLOGY AND ITS MODIFICATIONS IN THE DESIGN OF SECTIONALIZED HEAT EXCHANGERS WITH EXTENDED SURFACE FOR COOLING AIRBORNE ELECTRONIC EQUIPMENT, by B. T. Plizak and A. R. Saltzman. Phase rept. 14 Feb 56, 50p. 18 refs. Rept. no. NADC-EL-55101.
Order from LC mi$3.30, ph$7.80 PB 127 632

The information in this report represents the first attempt to provide a more practical and simplified technique of fin technology calculation for airborne electronic equipment. The method described is adequate, but it is felt that a more vigorous mathematical treatment to cover all possible fin configurations for electronic cooling applications is still required.

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
TABLES OF TRANSMISSION AND REFLECTION COEFFICIENTS OF LOSSY, SYMMETRICAL DIELECTRIC RADOME SANDWICHES, by Samuel Wolin. Phase rept. 22 Oct 53, 420p. 2 refs. Rept. no. NADC EL-52188.
Order from LC mi$11.10, ph$63.60 PB 140 738

This report contains a set of tables of transmission and reflection coefficients, as well as phase shift data for lossy, symmetrical dielectric radome sandwiches at various angles of incidence. The report supplements Naval Air Development Center (NADC) Report No. ADC EL-123-50, "The Electrical Design of Lossy High-Incidence Radomes," of 11 July 1950. It has been prepared for the benefit of designers who may be required to make a theoretical study of the electrical performance of a proposed radome design.

Air Force Cambridge Research Center, Bedford, Mass.
THE CORNER ARRAY, by Allan C. Schell. Jan 59, 31p. 4 refs. AFCRC-TR-59-105; AD-209 201.
Order from LC mi$3.00, ph$6.30 PB 140 637

An antenna has been designed and built which consists of an array located at the bisector of two intersecting conducting planes. The fields existing in such an antenna have been determined by ray tracing and by images. The advantages of using an array rather than a single element with a corner reflector are discussed. The results of an experimental verification are given, showing a thirteen degree wide beam from a sixty degree corner array, and an eight degree beamwidth from a thirty degree corner array.

Air Force Cambridge Research Center, Bedford, Mass.
MESSAGE AND SYNCHRONIZING TIMES ON AN/TSQ-13, by Philip A. Ferris. Jan 59, 14p. AFCRC-TN-59-127; AD-210 215.
Order from LC mi$2.40, ph$3.30 PB 140 407

The AN/TSQ-13 System is designed to transmit digital data along a network of operating sites. This report presents a brief analysis of the problems met when any site becomes inoperative and the network sequencing system is interrupted.

Air Force Cambridge Research Center, Bedford, Mass.
TABLE OF (SIN X)/X, by George E. Reynolds. Mar 57, 208p. AFCRC-TR-57-103; AD-117 063.
Order from LC mi$9.30, ph$31.80 PB 140 846

This compilation of values was prompted by the frequent appearance of (sin x)/x in the mathematics of antenna design and the consequent need for a table of smaller argument and greater accuracy than found in any existing table. It is presented in the belief that it will be of general service in the field of computation and of particular service in the design or construction of antennas.

Air Force Missile Test Center, Patrick AFB, Fla.
INTERIM AUTOMATIC DESTRUCT ANTENNA TESTING SYSTEM, by L. R. Westerburg. Engineering rept. 1 May 58, 27p. AFMTC TN-58-5; AD-134 284.
Order from LC mi$2.70, ph$4.80 PB 140 574

This report contains a study and design for automating the airborne field intensity measuring programs now conducted at AFMTC. Based on conclusions from actual engineering tests, this study presents a means of obtaining the desired radiation patterns in real-time plots. The capabilities of avialable range equipment were found adequate to complete all experiments. Section I outlines the study results in summary form. Section II presents the operational details and conclusive test results.

Air Force Missile Test Center, Patrick AFB, Fla.
REAL TIME DATA TRANSMISSION SYSTEM, by C. R. Scott and W. H. Butler. 16 June 58, 16p. AFMTC-TN-58-4; AD-134 281.
Order from LC mi$2.40, ph$3.30 PB 140 573

The purpose of this Technical Note is to explain the functional operation of the Milgo Digital Data Transmission System so that personnel with a non-engineering background may understand the various ways in which the radar, Telemetry Quantizing System, and time data are manipulated.

Armour Research Foundation, Chicago, Ill.
FEASIBILITY STUDIES FOR AIR-CELLULAR FEATHERWEIGHT HOUSINGS, by A. S. Kobayashi and A. J. Durelli. Rept. for 1 July 56-14 Feb 57 on Contract AF 30(602)1562. Mar 57, 74p. 19 refs. RADC TR-57-75; AD-114 431.
Order from LC mi$4.50, ph$12.30 PB 140 783

The air-cellular featherweight housing is constructed by joining the edges of flexible double-wall plastic triangular cells in such a way that the assembly of these cells can be inflated with pressurized air. The shape of the housing considered in this report is hemispherical. The objective of this research program is to determine the feasibility of this housing system in its application to radomes and shelters. The scope of this phase of the research program was limited to the feasibility analysis of forces and stresses.

Army [Rocket and Guided] Missile Agency, Redstone Arsenal, Ala.
HIGH ACCURACY LIQUID LEVEL MEASURING SYSTEM, by Thomas L. Greenwood. 29 July 58, 15p. Rept. no. DTI-TR-1-58.
Order from LC mi$2.40, ph$3.30 PB 140 529

Electrostatic properties of nonconducting liquids, such as kerosene and liquid oxygen, are used in the development of a discrete level detecting system. Effective values of branch capacitances in a bridge circuit varied by the presence or absence of liquid provide a signal, with an accuracy of 0.01 inch, which may be used for remote indication, recording, or control. The discussion includes design parameters, adjustment techniques, and application notes.

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF DEL MAR DK-F1 TOW TARGET RECEIVER, by William E. Castilo and Merwin A. Olson. 22 Dec 58, 50p. AFC rept. # DC-22-12-58 RdeC.
Order from LC mi$3.30, ph$7.80 PB 140 566

Results are presented on a laboratory investigation of the interference susceptibilities of a Del Mar DK-F1 Tow Target Receiver. This receiver operates in the frequency range of 285 to 315 MCS. Sensitivity and frequency stability were tested with respect to supply voltage variation, operating time, simulated altitude and vibration. Other characteristics (selectivity, spurious emissions, spurious responses, audio response and input VSWR) were also examined. A system bandwidth involving this receiver should be 1.5 MCS or $\pm$0.75 MCS wide for J/S ratios of plus 20 db or for "interference" signals of approximately 5000 uV/M with no control signal.

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF HALL-SCOTT

R-70 RECEIVER, by Charles R. Wise and Merwin A. Olson. 31 Dec 58, 35p. AFC rept. # DC-31-12-58-RdeC.
Order from LC mi$3.00, ph$6.30 PB 140 562

Results are presented on a laboratory investigation of the Hall-Scott Model R-70 (54.5094 MCS) receiver. Selectivity, spurious responses, sensitivity, VSWR, discriminator linearity and audio characteristics were examined as possible contributors to interference susceptibility. Two spurious responses were less than 65 db down; one, the Image (47.722 MCS) 26 db down, the other (52.81 MCS) 50 db down. For a J/S ratio of /20 db, a "clear channel" of 250 KCS (/ 125 KCS) is recommended. For frequency allocation the image response should also be considered.

Army Signal [Research and Development] Lab., Fort Monmouth, N. J.
A DIAL SWITCHING PLAN FOR THE DIVISION COMMUNICATION SYSTEM, by Scott S. Appleton. 16 Sep 57, 22p. 5 refs. Technical memo. no. M-1914.
Order from LC mi$2.70, ph$4.80 PB 140 207

Telephone communications for Division will be highly mobile. During periods of high mobility all communications will be by radio. At such times radio relay will provide the trunks and Radio Centrals will be used to serve the individual telephone users within the system. When the Division is in a static situation the additional circuits usually required for such conditions will be added by field wire and cable. The telephone user will be able to dial directly other local parties even while actually in motion. Normally, operators will not be involved in making calls except to route, by dialing, the long distance multi-switched calls. This technical memorandum outlines the automatic switching equipment general requirements that will be needed to provide the proposed Division Communication System.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE INFLUENCE OF SKIN EFFECT ON THE TEMPERATURE COEFFICIENT OF TRANSMISSION LINE WIRES, by Leon T. Wilson. 12 Aug 58, 34p. 3 refs. USASRDL Technical rept. 1958.
Order from LC mi$3.00, ph$6.30 PB 140 234

The influence of skin-effect on the AC temperature coefficient of resistance for transmission line wires is investigated. Generalized data are presented showing the ratio (F) of the AC rate of change of resistance with temperature $\frac{(dR)}{(dt)}$ to the DC rate of change of resistance, with temperature $\frac{(dR_o)}{(dt)}$ versus the skin-effect argument (X) over a range of (X) from 0 to 100. Similarly the ratio (M) of the AC temperature coefficient of resistance, α, to the DC temperature coefficient of resistance, α_o, is presented versus the skin-effect argument (X) from 0 to 100. Limitations of these data are discussed. Illustrative examples of the application of the data to specific lines are given.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
INVESTIGATION INTO THE STABILITY OF QUARTZ CRYSTAL UNITS WITH TIME, by P. E. Mulvihill. 29 Apr 58, 56p. 9 refs. E-1204.
Order from OTS $1.50 PB 151 530

The studies covered two areas of investigation, including the mounting base and enclosure, supporting structure, electrode metal, bonding agents and atmosphere of the container; the surface finish of the quartz plate, method of deposition of the metallic electrodes, cleaning procedures and curing temperatures. Several causes of aging are discussed and an analysis of data taken on several hundred crystals is presented.

[Army Signal Research and Development Lab.], Fort Monmouth, N. J.
INVESTIGATION OF SQUELCH CIRCUITS APPLICABLE TO RADIO SET AN/VRC-12, by Robert Farlee. Nov 56, 7p. Technical memo. no. M-1841; AD-128 921.
Order from LC mi$1.80, ph$1.80 PB 140 328

A squelch circuit was developed employing a locally generated keying tone and a synchronous detector. A block diagram of this circuit is shown.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
UNDERWATER CABLE GUIDANCE SYSTEM, by Claude O. Lanciano, Jr., and Robert E. Morris. Nov 58, 38p. Final rept. on Proj. 9-97-40-000, House Task 9.32, formerly Proj. 9-97-40-000, Task 9.5; AD-204 731.
Order from LC mi$3.00, ph$6.30 PB 140 565

This report presents the field test results and evaluation of three experimental underwater cable guidance systems for the proposed blind navigation of BARCs from a point offshore to a beach landing site at at Frobisher Bay, Baffin Island. All three systems were found deficient in the specific application under consideration, although each demonstrated a capability for conveying navigational information to a surface craft once it located the signal path. The principal objections were the inability to get on range and the difficulty experienced in maintaining the cable undamaged in a fixed position.

Automatic Mfg. Div., General Instrument Corp., Newark, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON HIGH VOLTAGE SILICON RECTIFIERS, by Robert W. Hull. Progress rept. for 31 May-30 Nov 57 on Contract DA 36-039-sc-72679(L). [1957] 71p.
Order from LC mi$4.50, ph$12.30 PB 136 735

A new alloying technique was devised. This technique has given much improved yields and also considerably improved electrical properties. An evaluation of silicon suitable for the high voltages required has been initiated. Some promising results are already appearing.

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RHENIUM FOR ELECTRON-TUBE APPLICATIONS, by C. T. Sims, G. B. Gaines and others. Scientific rept. no. 5 on Contract AF 19(604)1741. 1 June 58, 46p. 20 refs. AFCRC TN-58-176; AD-152 419.
Order from OTS $1.25 PB 151 523

Chemical reactivity of rhenium metal in contact with atmospheres containing carbon, boron, and water vapor, and in contact with aluminum oxide in vacuum. Fabricability of rhenium-carbon alloys, the constitution, fabricability, and other properties of rhenium-tantalum alloys, and the recrystallization characteristics and mechanical properties of the alloys of rhenium with tungsten and with molybdenum. Preliminary studies of ternary rhenium-tungsten-molybdenum alloys. Thermoelectric properties of thermocouples of rhenium against tungsten, molybdenum, W-30Re and Mo-35Re alloys.

Bell Telephone Labs., Inc., New York.
ENGINEERING SERVICES ON TRANSISTORS, by M. M. Atalla, R. Lindner and others. Interim technical rept. no. 14, 1 July-30 Sep 58, on Contract DA 36-039-sc-64618. 15 Oct 58, 84p. 6 refs.
Order from LC mi$4.80, ph$13.80 PB 140 251

Transistor reliability
New and improved transmission-type transistors
Transistor test methods
Transistor circuit components

Centro di Studio per la Fisica delle Microonde (Italy).
MECHANICAL TORQUE EXPERIENCED BY A CONDUCTING LOOP IN A CYLINDRICAL WAVE-GUIDE, by Giancarlo Casini and Laura Ronchi Abbozzo. Technical note no. 3 on Contract AF 61(052)67. Sep 58, 10p. 2 refs. AFCRC TN-59-114; AD-209 375.
Order from LC mi$1.80, ph$1.80 PB 140 404

The torque experienced by a conducting loop in a cylindrical waveguide has been evaluated in order to investigate how much the non - uniformities of the field may affect the value of the moment.

Centro di Studio per la Fisica delle Microonde (Italy).
RADAR FOR RESEARCH ON METEOR BURST PROPAGATION. Final rept. on Contract AF 61(052)44. Feb 59, 37p. 6 refs. AFCRC-TR-59-131; AD-213 853.
Order from LC mi$3.00, ph$6.30 PB 140 416

Contents:
Work done about meteors
Modifications to research plane, as far as the equipmental device is concerned
Design of the meteoric radar set
Construction of the meteoric radar set

Centro di Studio per la Fisica delle Microonde (Italy).
TRANSPORT OF ANGULAR MOMENTUM IN A WAVE GUIDE, by Giuliano Toraldo di Francia. Technical note no. 4 on Contract AF 61(052)67. Nov 58, 8p. 1 ref. AFCRC-TN-59-121; AD-209 907.
Order from LC mi$1.80, ph$1.80 PB 140 406

The angular momentum carried by electromagnetic radiation in a wave guide is evaluated by means of the mechanical actions exerted by the wave. In the case where the field consists of a superposition of two or more degenerate modes, one can assume the dielectric to have a very small conductivity and then evaluate the total moment exerted by the field upon the electric currents generated in the dielectric.

Cinch Mfg. Corp., Chicago, Ill.
DEVELOPMENT OF ELECTRON TUBE SOCKETS WITH REMOVABLE BUILT-IN CAPACITATORS, by William H. McKee. Rept. on Tube Sockets with Removable Built-In Capacitors, Contract AF 33(600)8697. Dec 54, 17p. WADC Technical rept. 54-510; AD-62 926.
Order from LC mi$2.40, ph$3.30 PB 140 380

A military grade tube socket with removable built-in by-pass capacitors was developed according to contract requirements. The resulting socket is an improvement in electrical and mechanical properties over the existing built-in capacitor sockets.

Colorado U. Engineering Experiment Station, Boulder.
SENSITIVITY AND FREQUENCY RELOLUTION OF A CYCLOTRON RESONANCE MICROWAVE DETECTOR, by J. C. Twombly. Technical rept. no. 6 on Contract [Nonr] 1147 (01). 1 Feb 57, 75p.
Order from LC mi$4.50, ph$12.30 PB 136 081

Contents:
Chap. I. Comparison of the tube performance and noise level in the regions above and below limiting perveance
Chap. II. Threshold sensitivity and dynamic range of a cyclotron resonance tube
Chap. III. Ultimate determining factors on frequency resolution by cyclotron resonance
Chap. IV. Static characteristics
Chap. V. Direction of the investigation in the immediate future
App.
A. Derivation of the equation for threshold sensitivity of a cyclotron resonance tube
B. Derivation of the equation for frequency resolution of a cyclotron resonance tube
C. Equations governing electron beam characteristics in the region of operation beyond limiting perveance
D. Lateral translation of electrons due to space-charge forces in a magnetically constrained electron sheet beam
E. Definition of symbols

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
DESIGN MANUAL OF METHODS OF FORCED AIR COOLING ELECTRONIC EQUIPMENT, by James P. Welsh. Rept. on Contract NObsr-63043. June 58, 239p. 44 refs. Rept. no. HF-845-D-19; NAVSHIPS 900, 194.
Order from LC mi$10.20, ph$36.30 PB 140 718

This Manual was prepared to aid electronic engineers in the thermal design of reliable electronic equipment. Principles and techniques to be followed in the design of electronic parts, assemblies, and equipments are outlined herein to permit heat transfer by forced convection to be reliably achieved.

Corning Glass Works, N. Y.
RESEARCH AND DEVELOPMENT OF GLASS CAPACITORS, by G. P. Smith and R. B. Randels. Final rept. for 1 Apr 52-31 Aug 54 on Contract DA 36-039-sc-15509. 31 Aug 54, 57p.
Order from LC mi$3.60, ph$9.30 PB 140 664

The range of glass capacitors has been extended to cover the low and medium power transmitting types. The capacitors are uncased and fabricated to permit manufacture of close tolerances over the entire capacitance spectrum.

Dikewood Corp., Albuquerque, N. Mex.
REGULAR SIMPLEX CODING, by B. L. Basore. Scientific rept. no. 1 on Contract AF 19(604)4078. 2 Jan 59, 20p. 3 refs. AFCRC TN-59-165; AD-213 609.
Order from LC mi$2.40, ph$3.30 PB 140 410

By perturbing the geometrical arrangement of a regular simplex, one vertex at a time, it is shown that such an arrangement of points corresponds to a minimum of the probability of error when the transmitted signals represented by the vertices of the regular simplex are equally likely, and the transition probabilities decrease with increasing distance between message points. Thus, it is held that regular simplex coding is possible and at least relatively desirable. Some of the properties of a regular simplex in hyperspace are discussed.

Eastman Kodak Co., Rochester, N. Y.
BASIC RESEARCH INVESTIGATION FOR AMMONIA VAPOR ACTIVATED BATTERIES, by John M. Freund and J. B. Schliff. Quarterly progress rept. no. 4, 15 June-14 Sep 58, on Contract DA 36-039-sc-74902. [1958] 25p.
Order from LC mi$2.70, ph$4.80 PB 140 618

Information is given on the performance of $Zn/NH_4SCN/PbO_2$ liquid system cells at low temperature and of Pb/NH_4SCN or NH_4NO_3/PbO_2 vapor-activated cells at room temperature. The liquid system work indicates that cell emf varies directly with the logarithm of NH_4SCN concentration from 0.1 to 30 molal. Both series of tests show that the higher the discharge rate, the greater is the acid concentration needed to achieve 100 percent reduction of PbO_2. The half-cell $Pb/PbSO_4$ has proved to be the most satisfactory reference electrode tested to date in liquid cells.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
CONTRIBUTIONS TO TRANSISTOR-RC NETWORK SYNTHESIS, by Basil R. Myers. Doctoral thesis. Technical note no. 7 on Contract AF 49(638)63. 20 Feb 59, 113p. 26 refs. AFOSR TN-59-73; AD-209 848.
Order from LC mi$6.00, ph$18.30 PB 140 237

We found that use of the negative impedance converter and of controlled sources stereotypes essentially all existing network realizations. A basic problem in searching for new techniques is the mathematical one of finding methods by which a given network function can be partitioned into suitable RC sub-functions, each of which may be of relatively high order, and each of which are either entirely positive or entirely negative. In contribution towards resolving this impasse, we first introduced a functional symbolic equivalent circuit for the junction transistor. This representation lends a ready interpretation between physical circuits and the mathematical functions describing them.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
A CORRELATION BETWEEN CLASSICAL AND POLE-ZERO SENSITIVITY, by James J. Mikulski. Doctoral thesis. Technical note no. 5 on Contract AF 49(638)63. 20 Feb 59, 91p. 28 refs. AFOSR TN-59-72; AD-209 847.
Order from LC mi$5.40, ph$15.30 PB 140 236

The correlation existing between the over-all sensitivity of a network or system function (Mason) and sensitivities of the poles and zeros, or roots, of that function (Truxal) is established. This unifies the studies previously carried out as separate entities. The pole-zero, or root, sensitivities have previously been defined for the cases where the coefficients of the rational network function were dependent linearly upon some parameter. This thesis extends the root sensitivity to the case of a nonlinear dependence of the coefficients, and in doing so introduces a concept of a second-order sensitivity that is applicable and useful in the classical sensitivity definition. In this work, the nature of the frequency dependence of the classical sensitivity is utilized to derive the root sensitivities.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
LEAST-SQUARES APPROXIMATION FOR BOTH MAGNITUDE AND PHASE BY RATIONAL FUNCTIONS, by K. S. Fu. Technical note no. 6 on Contract AF 49(638)63. 9 Feb 59, 71p. 37 refs. AFOSR TN-59-71; AD-209 846.
Order from LC mi$4.50, ph$12.30 PB 140 446

A method is presented to approximate both magnitude and phase within a given band. The specified magnitude and phase characteristics, either in the form of a function or in terms of a graphical plot, are approximated by a rational function in the sense of minimizing the least-squares error. The digital computer can be used to obtain accurate results quickly.

Electron Tube Research Lab., U. of Minnesota, Minneapolis.
STUDIES ON BASE NICKELS FOR OXIDE COATED CATHODES, by W. G. Shepherd. Scientific rept. no. 2, 15 July-15 Oct 58, on Contract AF 19(604)3890. 16 Feb 59, 105p. 14 refs. AFCRC TN-59-157; AD-211 449.
Order from LC mi$5.70, ph$16.80 PB 140 679

Effects of active metal anodes on the emissive properties of oxide coated cathodes are reported. While there is no appreciable enhancement of the emission capability of an oxide cathode based on an active nickel, the use of a heated Ti anode markedly reduces the anode deactivation of an active cathode.

Electronics Research Lab., U. of California, Berkeley.
SYNTHESIS OF RESISTOR-TRANSMISSION-LINE NETWORKS, by N. R. Welsh and E. S. Kuh. Rept. on Contract N7onr-295(29). 15 July 58, 60p. 17 refs. Rept. no. 74; IER Series no. 60, Issue no. 209.
Order from LC mi$3.60, ph$9.30 PB 140 396

The purpose of this study is to summarize and extend available techniques of distributed-parameter network synthesis. The applicability of lumped-parameter techniques to this problem is demonstrated, as is the utility of several techniques which are peculiar to the distributed case. Additionally, those lumped-parameter synthesis techniques which avoid the use of mutual coupling by the parallel connection of networks are found to be much more powerful when applied to the distributed network problem.

Electronics Research Labs., Columbia U., New York.
SIMULATION STUDY, by H. Dern. Final rept. F/133 on Contract AF 19(604)1572. 30 Sep 58, 20p. 33 refs. CU-21-58-AF-1572-ERL; AFCRC-TR-58-194; AD-160 874.
Order from LC mi$2.40, ph$3.30 PB 140 412

The research program conducted under this contract has centered on problems related to radar system analysis, synthesis and design in the broad sense. The program has considered problems in search radar simulation, search radar angular accuracy, continuous and sampled control system theory, hypothesis testing and estimation.

Electronics Research Labs., Columbia U., New York.
THEORY AND DESIGN OF INPUT ADAPTIVE SYSTEMS, by Herbert L. Groginsky. Technical rept. T-11/133 on Contract AF 19(604)1572. 30 Sep 58, 139p. 34 refs. CU-17-58-AF-1572-ERL; AFCRC-TN-58-397; AD-160 854.
Order from LC mi$6.90, ph$21.30 PB 140 539

This work presents a theory for the design of input adaptive control systems. It is assumed that error-free measurement of the system input and the system behavior is permitted, but only limited changes in the system characteristics can be affected by the control variables at the designer's disposal. It is shown that within this limitation for a wide class of inputs and systems and for a certain class of measures of the system performance, an optimal adaptive system behaves as a relay or switched system during the transient period and as a continuous system during periods in which the input is reproduced identically.

Engineering Div., Air Materiel Command, Wright-Patterson AFB, Ohio.
COOLING ELECTRONIC EQUIPMENT BY DIRECT EVAPORATION OF LIQUID REFRIGERANTS, STUDY OF, by Albert D. Greene and John C. Wightman. 10 June 48, 75p. Serial no. MCREE-48-32; ATI-31 943.
Order from LC mi$4.50, ph$12.30 PB 136 065

The development and application of a direct evaporative refrigeration method to maintain a regulated temperature of the various component parts of electronic equipment within the desired functional limits are described. The factual data derived from tests and experiments conducted to demonstrate the simplicity of theory and method, the flexibility of application and advantages to be obtained from application of the subject method to various types of electronic equipment, as illustrated by the experimental Radar Set AN/APT-4, are included. The conclusion is drawn that the method is sound in principle and is applicable to various other types of electronic equipment. Recommendation is made that study and investigation of improvements and practical application of this method is current and future designs for military use be continued. Some figures are illegible.

General Electric Co., Schenectady, N. Y.
INDUSTRIAL PREPAREDNESS STUDY FOR PACKAGED VOLTAGE TUNABLE MAGNETRON TYPE Z-5283, by W. M. Piwnica. Quarterly progress rept. no. 8, 1 Nov 58-31 Jan 59, on Contract DA 36-039-sc-70278. 24 Feb 59, 8p.
Order from LC mi$1.80, ph$1.80 PB 140 376

During this report period several packages incorporating the latest developments were built. Three of these units were life tested satisfactorily. Four approval samples were assembled and these units meet all the contract specifications. A breakdown of the progress on the individual package components is given in the following sections.

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF CATHODE MATERIALS FOR PULSE MODULATORS, by Donald L. Schaefer, James A. Murphy and others. Final engineering rept. on Contract NObsr-57029. 1 Sep 56, 72p. 7 refs. Rept. no. R-45F; AD-108 200.
Order from LC mi$4.50, ph$12.30 PB 140 435

During the program both cold cathodes and hot or thermionic cathodes were investigated. The cold cathode phase of the work included experiments with fine wire ignition, sponge cathodes, ion starting devices, gallium cathodes, dielectric starters, excitrons, semi-conductor ignitors and arc track studies. The hot cathode phase included studies of conventional oxide cathodes in basic thyratron struc-

tures and in large and small test diodes. Several sample tubes employing the more promising cold cathode designs were built and the test results are reported.

General Electric Microwave Lab., Palo Alto, Calif.
LOW NOISE, SHF BAND TRAVELING-WAVE TUBE, by Frederick B. Fank and Frederick M. Schumacher. Rept. on Electronic Tubes and Transistors, Contract AF 33(616)2818. Dec 56, 42p. WADC Technical rept. 56-451, Pt. 1; AD-118 132.
Order from LC mi$3.30, ph$7.80 PB 140 549

This is a final report on the development of an electron tube designated as a Low-Noise, SHF Band, Traveling-Wave Tube. The electrical specifications included a noise figure less than 13 db and a gain greater than 18 db with less than 5 db variation over the frequency band of 7.5 kmc to 11.3 kmc. The tube developed used a helix for the slow-wave circuit, cavity couplers, coupled helix attenuators, and a three region gun for noise reduction. A program was outlined for the construction of as many of these tubes as possible, each with a modification so as to emperically determine the best design for a broadband low-noise tube. By proper design it was possible to obtain tube noise figures as low as 8.4 db and less than 10.6 db over the band.

General Electric Microwave Lab., Palo Alto, Calif.
LOW NOISE, SHF BAND TRAVELING-WAVE TUBE, by Howard H. C. Chang and Michael J. Ozeroff. Rept. on Electronic Tubes and Transistors, Contract AF 33(616)2818. July 57, 14p. WADC Technical rept. 56-451, Pt. 2; AD-130 875.
Order from LC mi$2.40, ph$3.30 PB 140 550

Investigations indicate that a transverse current TWT is superior to the longitudinal TWT as far as the minimum obtainable noise figure is concerned. Workable tube structures may be difficult to achieve to realize the theoretical advantages. The transverse-field, transverse-current SHF traveling-wave tube is a promising device, even though it would possess operating characteristics quite different from those of existing tubes. A discussion of the work accomplished and preliminary results obtained are given in this report. (See also PB 140 549)

Hughes Aircraft Co., Culver City, Calif.
S-BAND LOW-NOISE BACKWARD-WAVE AMPLIFIER, by W. M. Mueller. Quarterly progress rept. no. 4 for 1 Apr-30 June 58 on Contract DA 36-039-sc-74908. [1958] 20p.
Order from LC mi$2.40, ph$3.30 PB 140 247

Results of investigations of the Hughes low-noise gun have been published. The noise performance of four tubes constructed during the past quarter is discussed The construction and performance of the first coupled helix tube are described. Initial work on ruggedization of the tube and studies of possible focusing schemes are presented.

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
TRANSISTOR OPERATIONAL AMPLIFIER EFFECT OF INPUT IMPEDANCE ON ACCURACY, by Joel Engel. Rept. on Contract AF 04(647)103. Dec 57, 21p. 6 refs. Rept. no. E-671; AD-155 317.
Order from LC mi$2.70, ph$4.80 PB 139 954

The utilization of transistors in operational amplifiers necessitates the consideration of amplifier properties not present when vacuum tubes are used. Because of the physical characteristics of a vacuum tube the input impedance to the electronic amplifier is effectively infinite and the forward gain is a voltage gain. When transistor amplifiers are used, the input impedance is not infinite, and a current gain as well as voltage gain, is present.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
SOME PULSE-DOPPLER RADAR-DESIGN CONSIDERATIONS, by Robert E. Richardson. 12 Aug 57, 33p. 6 refs. Technical rept. no. 154.
Order from LC mi$3.00, ph$6.30 PB 140 422

While conventional pulsed radar effectively accomplishes the functions of range measurement and range resolution, it is unable to separate targets that occur within the same space element but have different velocities (e.g., it cannot distinguish between moving targets and fixed clutter). The CW radar, which was developed to allow velocity discrimination, does not give range information, although various schemes such as amplitude or frequency modulation have been devised to allow useful range determination. Of course, either scheme has angular resolution determined by its antenna array. A pulse-Doppler radar combines the range measuring and resolving advantages of the pulsed radar with the velocity discrimination capabilities of the CW radar. The combination of the two principles leads to an increase in equipment complexity over that which would be required for either system alone, but the advantages of the pulse-Doppler system often justify the added complexity. The range-measuring and velocity-measuring capabilities of a pulse-Doppler system are interrelated, and one purpose of this report is to discuss their relationship. The information presented herein was collected in conjunction with the development of a tracking radar. The same general considerations also apply to search radars, however, and some of the dissimilarities are noted.

Martin Co., Baltimore, Md.
5 KW POWER AMPLIFIER. Final rept. on Contract AF 19(604)3863. Mar 59, 31p. ER-10676; AFCRC TR-59-124; AD-212 465.
Order from LC mi$3.00, ph$6.30 PB 140 635

The amplifier described in this report is a small (3 cu ft), lightweight (185 lb), self-contained equipment designed for airborne use. It is a single frequency unit which delivers five kw of radio frequency power when supplied with five watts of input power. The ability to build so powerful an amplifier in so small a space stems from the use of evaporative cooling. This technique uses the heat of vaporization of water for cooling, which is lighter and more efficient than conventional methods. The development of this equip-

ment was originally undertaken to demonstrate the advantages of cooling by evaporation of water.

[Material Lab.], New York Naval Shipyard, Brooklyn.
DROPOUT CHARACTERISTICS OF MAGNETIC RECORDING TAPE. Final rept. 11 Mar 59, 1p. 2 refs. Lab. project 5849-5.
Order from LC mi$1.80, ph$1.80 PB 140 484

Previous information provided for control over dropout characteristics in an interim tape specification. However, it was indicated that the basis for obtaining the information was an arbitrary one and that further work would have to be done to obtain a better understanding of the dropout problem and to provide information for specification development directly related to the operational requirements of tape instrumentation systems. Information for dropout criteria is being obtained under other projects. To avoid duplication of effort, further work will not be conducted under this project number.

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF CHARACTERISTICS OF SIX CONDUCTOR CABLE FOR 3 PHASE 400 CYCLE POWER, by Robert Forbes and Samuel H. Behr. Final rept. 10 Nov 58, 23p. Lab project 5941-1.
Order from LC mi$2.70, ph$4.80 PB 140 486

The subject of this investigation was to determine the difference in 400 cycle characteristics between a standard TSGA-400 cable and an experimental six conductor, MSGA-6 (200) cable. Comparisons of current carrying capacity, conductor resistance and inductance were made using direct current, 60 cycle, and 418 cycle alternating current. Inductance and resistance measurements were taken using the method described under Naval Research Laboratory Report E-3125. The results indicate that at 418 cycles the conductor resistance and inductance values of the MSGA-6 (200) cable are approximately 70% and 50%, respectively, of the corresponding values of the TSGA-400 cable. The six conductor cable has approximately one-half the voltage regulation of the three conductor cable. The results also indicate that for an equal rise of conductor temperature the MSGA-6 (200) cable will carry approximately 25% more 418 cycle current.

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF TIMES FACSIMILE RECORDER AN/UXH-2( ), MANUFACTURED BY THE TIMES FACSIMILE CORP., NEW YORK, N. Y. Final rept. 12 June 58, 16p. 4 refs. Lab. project 5315-140.
Order from LC mi$2.40, ph$3.30 PB 140 491

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF ZINC PLATED CRIMP TYPE LUG TERMINALS SUBMITTED BY THOMAS & BETTS COMPANY, INC., ELIZABETH, NEW JERSEY, by William H. Kohlmann. Final rept. 22 Aug 58, 8p. Lab. project 5568-15.
Order from LC mi$1.80, ph$1.80 PB 140 493

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION ON SPECIAL DESIGN STUDY OF RECHARGEABLE HAND-LANTERN EQUIPMENT MANUFACTURED BY GULTON INDUSTRIES, INC., by S. Feldman and M. A. Popkin. Final rept. 19 June 58, 14p. Lab. project 5801-1.
Order from LC mi$2.40, ph$3.30 PB 140 509

Three Navy Type K10-A hand lanterns were modified to operate on two hermetically sealed VO-4 nickel-cadmium rechargeable batteries. The performance characteristics and costs of the modified units were compared with those of the standard lantern using BA-23 batteries. It was found that the nickel-cadmium unit is more costly to install and delivers emergency lighting for considerably less time. It also requires excessive trickle charge time to reach a useful state of charge and was found to exhibit electrolytic leakage which would reduce battery life.

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF EXPERIMENTAL 10-PAIR FIRE RESISTANT TELEPHONE CABLE, by A. M. Deleeuw. Final rept. 27 Jan 59, 26p. Lab. project 5248-126.
Order from LC mi$2.70, ph$4.80 PB 140 504

Two experimental communication cables were evaluated as part of a program to develop shipboard cables having reduced diameter and weight combined with improved resistance to heat, fire and other environmental conditions. The two cables were factory made samples similar to previous models which had been built and evaluated by the Material Laboratory. The samples consisted of 10-pair telephone cables insulated with combinations of glass, silicone resin and nylon enclosed in a vinyl jacket and aluminum armor. The results confirmed previous tentative conclusions that an acceptable degree of fire and abrasion resistance can be obtained in an insulation wall of about 13 mils thickness. Further development is required to obtain acceptable circuit identification and dielectric strength.

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF LOW NOISE TRAVELING WAVE TUBES, by Bernard Kilimnik. Final rept. 9 Mar 59, 43p. 10 refs. Lab. project 5032-K-20.6, pt. 9.
Order from LC mi$3.30, ph$7.80 PB 140 498

Two sample low noise traveling wave tubes were studied to determine their performance suitability and limitations as microwave amplifiers. Noise figure as a function of electrode voltages, solenoid current and frequency was measured as well as the cold VSWR, gain-frequency and gain-helix voltage characteristics of the tubes. Well regulated voltage and current supplies were found to be needed for stable operation of these narrow band tubes. Measurement techniques were laborious, and automated procedures are clearly called for.

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF "TEFLON" FUSED-FILM INSULATED SILVER-COATED COPPER HOOK-UP WIRE SUBMITTED BY INSO PRODUCTS LTD., by

F. A. Liubicich. Final rept. 11 Aug 58, 7p. Lab. project 4861-F-35.
Order from LC mi$1.80, ph$1.80 PB 140 499

Material Lab., New York Naval Shipyard, Brooklyn.
QUALIFICATION INSPECTION OF NO. 222-10 CONTROL SWITCH MANUFACTURED BY DETROIT CONTROL CORPORATION, DETROIT, MICH. Final rept. 29 Sep 58, 5p. Lab. project 5274-E-13.
Order from LC mi$1.80, ph$1.80 PB 140 490

[Material Lab.], New York Naval Shipyard, Brooklyn.
RESULTS OF NEW EVALUATION ON FIELD CHANGE NO. 1 TO THE AN/SRD-7, SUBMITTED BY STEWART-WARNER ELECTRONICS, CHICAGO, ILLINOIS. Supplementary rept. 17 June 58, 2p. 5 refs. Lab. project 5315-142.
Order from LC mi$1.80, ph$1.80 PB 140 492

Material Lab., New York Naval Shipyard, Brooklyn.
SPECIFICATION DEVELOPMENT ON "BONDAR" FILM INSULATED HIGH TEMPERATURE MAGNET WIRE SUBMITTED BY WESTINGHOUSE ELECTRIC CORP., BUFFALO, NEW YORK, by H. Pinski. Part 3; Final rept. 18 Mar 59, 16p. Lab project 4861-F-27, Pt. 3.
Order from LC mi$2.40, ph$3.30 PB 140 500

Microwave Associates, Inc., Burlington, Mass.
ENGINEERING REFINEMENT PROGRAM FOR S BAND TR TUBE EST-25( ), by Lawrence Gould. Quarterly progress rept. no. 2, 1 July-30 Sep 58, on Contract DA 36-039-sc-75039. [1958] 39p.
Order from LC mi$3.00, ph$6.30 PB 140 256

A non-uniform temperature shock test has been applied to encapsulated windows with no evidence of deterioration under the conditions tested. The test consists of simulating the conditions of an RF discharge with an AC heating coil. Seventy-five watts of AC power produced a capsule temperature as high as 260° C.

Microwave Associates, Inc., Burlington, Mass.
RESEARCH AND DEVELOPMENT PROGRAM ON A MINIATURE X-BAND PULSED MAGNETRON, by A. C. Bougas. Quarterly progress rept. no. 3, 1 Apr-1 July 58, on Contract DA 36-039-sc-74919. 27 Feb 57, 27p.
Order from LC mi$2.70, ph$4.80 PB 140 671

A description of the research and development work done on the MA208 tunable magnetron during the third quarter is given. Results of "cold tests" on a new tuner crown utilizing a ceramic insulating base are presented. Low level test results on a combination L-C type tuner crown are described in the report. The effects of a design change in the output section are noted which indicate further work is required to properly match the high end of tuning band. Cathode and magnet design changes are discussed. Results of operating life tests are presented. An illustration showing the outline configuration of the MA208 with the new magnet design is included.

Microwave Engineering Labs., Inc., Palo Alto, Calif.
RESEARCH AND DEVELOPMENT OF A SOLID STATE PARAMAGNETIC MASER, by Perry H. Vartanian. Quarterly progress rept. no. 2 (Scientific rept. no. 2) for 10 Sep-Dec 58 on Contract AF 19(604)4071. 9 Jan 59, 21p. 1 ref. AFCRC-TN-59-120; AD-209 906.
Order from LC mi$2.70, ph$4.80 PB 140 405

A cavity maser has been successfully operated with the c crystal axis of the ruby oriented at 82° and 24° relative to the dc magnetic field. The amplifier operates at 2600 megacycles with an X-band pump. Several slow-wave structures for traveling-wave masers have been designed and constructed. These include inter-digital line and comb structures. A completely filled cavity structure is also being fabricated to study its bandwidth capabilities.

Microwave Lab., Stanford U., Calif.
HIGH-POWER APPLICATIONS OF THE CONNECTED-RING STRUCTURE IN TRAVELING-WAVE TUBES, by Walter Revis Ayers. Scientific rept. no. 9 on Contract AF 19(604)1930. Dec 58, 183p. 42 refs. M. L. rept. no. 554; AFCRC TN-58-586; AD-207 168.
Order from LC mi$8.40, ph$28.80 PB 140 614

Existing slow-wave circuits which are suitable for use in high peak or average power traveling-wave amplifiers tend to have considerably less bandwidth than that exhibited by low-power traveling-wave tubes. This study relates to two new circuit configurations which are suitable for use at high power levels and which have bandwidths greater than those exhibited by existing high-power circuits.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
BROADBAND HIGH POWER COAXIAL LINE COUPLERS, by Stanley Greenblatt. Quarterly rept. no. 3, 1 Nov 57 to 31 Jan 58, on Contract AF 30(602)1735. 28 Feb 58, 14p. Rept. R-626. 3-58; PIB-554.3; RADC-TN-58-103; AD-148 689.
Order from LC mi$2.40, ph$3.30 PB 135 987

The first model of the short slot coupler is being constructed by the model shop. A preliminary assembly drawing and cross-sectional drawing are shown. An analysis of a three arm branched guide duplexer is given and the transmission and reception properties are presented graphically. During transmission the VSWR limits of 1.3 occur at frequencies of 580 mc. and 1020 mc. thus giving a bandwidth of 440 mc. or 55%. On reception the transmission from antenna to receiver falls to one db. below the response at 800 mc. at frequencies of 772.5 mc. and 827.5 mc. thus giving a bandwidth of 50 mc. or 6.25%.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MAGNETIC AMPLIFIERS WITH D-C COUNTER E. M. F. LOADS, by Enrico Levi. Rept. on Contract Nonr-839(05). 16 Apr 58, 154p. 10 refs. Rept. no. R-646-58; PIB-574.
Order from LC mi$7.50, ph$24.30 PB 140 720

One typical field of application is automatic speed control, where magnetic amplifiers combined with a D-C machine provide an efficient, stable, rugged and reliable drive which can be connected directly to a standard a-c supply. The performance of a magnetic amplifier is affected by the presence in the load circuit of an active element such as the armature of a D-C motor or an electrolytic cell. This report deals with the analysis and synthesis of magnetic amplifiers whose load circuit includes a source of D-C counter e.m.f. The case considered being the most general, the method of attack and the results apply to all other kinds of loads.

Miller, August E., North Bergen, N. J.
DESIGN, DEVELOPMENT AND CONSTRUCTION OF PIEZO-ELECTRIC CRYSTAL UNITS, by Charles Hummer, Floyd Constable and others. Final rept. for May 49-Nov 50 on Contract W36-039-sc-44510. July 53, declassified 10 Sep 53. 78p.
Order from LC mi$4.50, ph$12.30 PB 140 274

This report details the crystallographic orientations and dimensions of the quartz plates especially developed for 200°C operations. It supplies the circuit used for exciting these crystal units and presents typical performance data and other important information.

Miller, August E., North Bergen, N. J.
DEVELOPMENT AND CONSTRUCTION OF A PACKAGED TEMPERATURE CONTROLLED CRYSTAL OSCILLATOR, by Ernest R. Borho. Final rept. on Contract W36-039-sc-44485. 97p.
Order from LC mi$5.40, ph$15.30 PB 140 273

This report gives information necessary for manufacturing the PkO Unit which includes the essential details of the crystal oven construction and an outline of a proposed plant procedure for matching the oven's operating temperature to the turning point of the crystal's frequency-temperature curve.

Miller, August E., North Bergen, N. J.
HIGH FREQUENCY PIEZO QUARTZ PLATES IN THE 20 TO 60 MEGACYCLE RANGE, by August E. Miller. Final rept. on Contract W36-039-sc-33655. 102p. [1948]
Order from LC mi$5.70, ph$16.80 PB 140 272

Fundamental high frequency quartz plates cut at AT and BT angles are extremely thin and fragile. The ordinary crystal manufacturing manipulations had to be greatly refined to suit the delicate nature of these blanks. The examination of the blanks submitted was performed under moderate magnification. It revealed that more than 50% of them contained cracks and flaws, some of which only appeared after etching. Crystals were successfully mounted in both CR-9 and CR-7 type holders. High drive has less influence on a crystal mounted in a CR-9 holder than it does on one mounted in a CR-7 holder. This research has conclusively proved that high frequency fundamental plates in the 20 to 60 megacycle range can be mounted in standard holders and can be made to operate in a parallel resonant circuit. Whether or not such crystals can be manufactured economically enough to be commercially practical, is another question.

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Fred Haber and Kamal Ya'coub. Progress rept. no. 46, 1 July-30 Sep 57, on Contract NObsr-72505. 15 Oct 57, 15p. 2 refs. Moore School rept. no. 58-08.
Order from LC mi$2.40, ph$3.30 PB 140 516

Contents:
Progress is reported on impulse response of double tuned circuits; objective noise measurements and testing programs. A report is included on application of the quasi-peak circuit to the measure of probability density function. (See also PB 140 515)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Yonas Peless and Jehuda T. Suss. Progress rept. no. 43, 1 Oct to 31 Dec 56, on Contract NObsr-72505. 15 Jan 57, 32p. 2 refs. Moore School rept. no. 57-10.
Order from LC mi$3.00, ph$6.30 PB 140 513

Contents:
Progress is reported on quasi-peak detector charge time; noise figure reduction; objective noise measurements; and transient behavior of indicating instruments. A report is included on the transient behavior of indicating instruments.

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Yona Peless and Jehuda T. Suss. Progress rept. no. 44, 1 Jan-31 Mar 57, on Contract NObsr-72505. 15 Apr 57, 27p. 5 refs. Moore School rept. no. 57-16; AD-141 177.
Order from LC mi$2.70, ph$4.80 PB 140 514

Contents:
Progress is reported on impulse response of cascaded double tuned circuits; objective noise measurements; and time constants of e quasi-peak detector. A report is included on build-up time rectified voltage for suddenly applied C. W. in a linear detector. (See also PB 140 513)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Yona Peless and Jehuda T. Suss. Progress rept. no. 45, 1 Apr-30 June 57, on Contract NObsr-72505. 15 July 57, 32p. 7 refs. Moore School rept. no. 58-03.
Order from LC mi$3.00, ph$6.30 PB 140 515

A report is included on impulse response of cascaded double tuned circuits. (See also PB 140 514)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Fred Haber and Yona

Peless. Progress rept. no. 47, 1 Oct-31 Dec 57, on Contract NObsr 72505. 15 Jan 57, 31p. 3 refs. Moore School rept. no. 58-16.
Order from LC mi$3.00, ph$6.30 PB 140 517

Contents:
Impulse response of double tuned circuits
(See also PB 140 516)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Fred Haber, Kamal Ya'coub, and Jehuda T. Suss. Progress rept. no. 48, 1 Jan - 31 Mar 58, on Contract NObsr-72505. 15 Apr 58, 72p. 11 refs. Moore School rept. no. 58-19.
Order from LC mi$4.50, ph$12.30 PB 140 518

Contents:
BICOM error probability
Application of the quasi-peak circuit to the measurement of probability density function
(See also PB 140 517)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Fred Haber, Kamal Ya'coub, and J. Diamessis. Progress rept. no. 49, 1 Apr - 30 June 58, on Contract NObsr 72505. 15 July 58, 55p. 8 refs. Moore School rept. no. 58-25.
Order from LC mi$3.60, ph$9.30 PB 140 519

Contents:
Performance tests on AN/URM-41
(See also PB 140 518)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE, by Fred Haber, Frank Roberts, and Kamal Ya'coub. Progress rept. no. 50, 1 July-30 Sep 58, on Contract NObsr-72505. 15 Oct 58, 32p. 4 refs. Moore School rept. no. 59-01.
Order from LC mi$3.00, ph$6.30 PB 140 520

Contents:
Evaluation tests of Stoddart impulse generator
(See also PB 140 519)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY ELECTRO-MECHANICAL FILTERS, by B. Niederman and Stanley P. Lapin. Quarterly progress rept. no. 2, 1 Aug-31 Oct 52, on Contract DA 36-039-sc-15535. [1952] 37p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 140 572

Equations are developed which give the analogous electrical circuits of long, thin, aelotropic bars of various wavelengths. Similar equations are developed for thin near resonant, isotropic plates. It is shown that a singly rotated X-cut quartz plate cannot have the same value of "Poisson's Ratio" as similar metal plates used in a Motorola mechanical filter. However, experimental results are discussed of a $-18\frac{1}{2}^{\circ}$ X-cut quartz crystal which was found to drive this filter. An anal sis of the filter curve presented, as a goal, by the government is made.

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY ELECTRO-MECHANICAL FILTERS, by B. Niederman and Stanley P. Lapin. Quarterly progress rept. no. 4, 1 Feb-30 Apr 53, on Contract DA-36-039-sc-15535. [1953] 25p. 1 ref.
Order from LC mi$2.70, ph$4.80 PB 140 568

Work on a lumped constant filter using a single crystal, in conjunction with coils and capacitors, is described. An unusual crystal, which will give a lower impedance filter, is discussed. A magnetostrictive drive filter is described, and quartz plates to drive a similar filter piezoelectrically are discussed. (See also PB 140 572)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY ELECTRO-MECHANICAL FILTERS, by B. Niederman and Stanley P. Lapin. Quarterly progress rept. no. 5, 1 May-31 July 53, on Contract DA 36-039-sc-15535. [1953] 36p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 140 569

First results on a very low inductance quartz crystal resonant at 455 KC are discussed. This crystal is to be used in the bridged-toe type filter. The results on the first three metal plate filters driven with quartz transducers are described. The effect of Q on band pass filter responses is discussed. The analysis of the required number and types of filter sections, to meet the desired curve, which was started in previous quarterly reports, is continued. (See also PB 140 568)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY ELECTRO-MECHANICAL FILTERS, by B. Niederman and Stanley P. Lapin. Quarterly progress rept. no. 6, 1 Aug-31 Oct 53, on Contract DA 36-039-sc-15535. 10 Dec 53, 36p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 140 567

Experimental results on low inductance crystals produced to date are discussed. Other types of possible low inductance crystals are presented. Analysis of a "low" impedance crystal filter of the lumped constant type is made. The effects of utilizing termination sections with the lumped constant filters are discussed. Designs of two types of such sections are made. A novel machine for fabricating unusual shapes in quartz, as might be required in mechanically coupled filters, is described. (See also PB 140 569)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY ELECTRO-MECHANICAL FILTERS, by B. Niederman and E. Bedrosian. Final rept. for 1 May 52-30 Apr 55 on Contract DA 36-039-sc-15535. [1955] 79p. 4 refs.
Order from LC mi$4.50, ph$12.30 PB 140 570

The technical requirements of this investigation are discussed. The work covered by the various quarterly

progress reports is surveyed. Each avenue of investigation is considered separately and a summary of its progress from inception to ultimate disposition presented. Some attention was directed during the final period to the possibility of utilizing active elements as circuit auxiliaries in an effort to obtain performance characteristics not usually attainable with passive elements. Vacuum-tube and transistor Q-multipliers are designed and typical filter applications presented.

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, by Leonard G. Chase. Quarterly progress rept. no. 3, 25 Dec 51-25 Mar 52, on Contract DA 36-039-sc-15338. 10 Apr 52, declassified, 24p.
Order from LC mi$2.70, ph$4.80 PB 140 601

Characteristics and modes of vibration for several thin Z cut rings are discussed. Various circuits have been developed expressly for use as ring oscillator networks. Experimental data regarding ring dimensions and frequencies is presented. Circuits for the measurement of frequency-temperature properties and equivalent circuit constants are proposed.

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, by B. Niederman and L. G. Chase. Quarterly progress rept. no. 4, 25 Mar-25 June 52 and Interim rept no. 5, 25 June-25 Dec 52, on Contract DA 36-039-sc-15338. [1953] 31p.
Order from LC mi$3.00, ph$6.30 PB 140 602

Present techniques employed in the fabrication of the current ring resonators are presented. The electrode choice and the means for electro-mechanical fastening, using standard or cold soldering methods, are discussed. Variations on previously presented circuitry which are useful for recording performance data of the rings are shown. Equipment is specified which allows measurement of the frequency constants of the rings. Sample calculations and preliminary data regarding equivalent circuit values are tabulated. (See also PB 140 601)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, by B. Niederman, L. G. Chase, and Robert Christy. Quarterly progress rept. nos. 6-7, 25 Dec 52-25 June 53, on Contract DA 36-039-sc-15338. [1953] 47p. 9 refs.
Order from LC mi$3.30, ph$7.80 PB 140 603

Design equations are presented for the fabrication of rings with a desired frequency and turnover point of the frequency-temperature characteristic. A relationship is shown connecting the performance of flexural vibrators operating at fundamental and overtone modes. A brief investigation of several flexure modes is made in an attempt to find vibrators having a practical physical size for a desired temperature-frequency characteristic. Approximate frequency equations for these flexural vibrators are included. These are obtained by the method of Rayleigh. A discussion of the characteristics of tuning-forks and cantilever vibrators is presented, and their structural and performance advantages are compared to a 1 KC ring vibrator having a room temperature vertex of the temperature-frequency characteristic. (See also PB 140 602)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, by B. Niederman and Leonard G. Chase. Quarterly progress rept. no. 8, 25 June-25 Sep 53, on Contract DA 36-039-sc-15338. [1953] 46p. 5 refs.
Order from LC mi$3.30, ph$7.80 PB 140 604

A frequency product term, $\frac{fl^2}{w}$, has been experimentally determined for design use in resonators required by the contract. A description of the operation of the Raytheon Ultrasonic abrasive cutter, as useable for cutting ring resonator shapes, is presented. Some effects of the amount of electroding area on resonator frequency, activity, and equivalent parameters are indicated. Equivalent circuit parameter calculation results, for ring resonators as two and three terminal networks, are tabulated. Temperature-frequency curves are shown for several ring and bar resonators. The relative characteristics in the operation of tuning fork vibrators are discussed. Desired modifications for existing oscillator circuitry are submitted. (See also PB 140 603)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, Bernard Niederman and Leonard G. Chase. Final rept. on Contract DA 36-039-sc-15338. 30 Aug 54, 133p. 23 refs.
Order from LC mi$6.90, ph$21.30 PB 140 606

A theoretical analysis and the results of experimental investigation of the equivalent circuit characteristics of low frequency quartz ring resonators in the frequency range of 1 to 5 Kc. are presented. A comparison is made with flexural bars and other types of vibrators regarding natural frequencies, physical size requirements, and temperature-frequency characteristics. Methods of producing flexure and achieving sustained vibrations in conjunction with appropriate vacuum tube circuitry are described. Details of fabrication, including an investigation of ultrasonic cutter techniques, are included. A discussion of experimental results including complete design information for ring resonators and experimental tuning fork appears. Recommendations for future investigation are presented. (See also PB 140 605)

Motorola, Inc., Chicago, Ill.
LOW FREQUENCY RING RESONATORS, by B. Niederman and Leonard G. Chase. Interim progress rept. no. 9, 25 Sep 53-25 Mar 54, on Contract DA 36-039-sc-15338. [1954] 55p.
Order from LC mi$3.60, ph$9.30 PB 140 605

Recent fabrication techniques involving the use of an ultrasonic cutter, diopter laps, and Felker DiMet Core Drills are described. Techniques and characteristics of the ultrasonic cutter as regards the cutting of complex shapes of quartz are shown. Results of several methods of attaching support and contact wires to quartz are presented. These involve the use of thermosetting adhesives and soldering to spots of

fired silver. A method of depositing metallic silver through chemical action is discussed briefly. (See also PB 140 604)

National Bureau of Standards, Washington, D. C.
WORLD MAPS OF F2 CRITICAL FREQUENCIES AND MAXIMUM USABLE FREQUENCY FACTORS, by Donald H. Zacharisen. Apr 59, 244p. Technical note no. 2.
Order from OTS $3.50 PB 151 361

This report was prepared for the purpose of presenting six months of contour maps and charts for use in predicting F2-layer maximum usable frequencies. Prediction maps for each even hour of Greenwich Mean Time and charts in which time is continuous along the abscissa are given for the months of January, March, June, July, September and December. The four parameters used for predicting MUFs are foF2 and the 4000 km MUF factor for a twelve-month running average Zurich sunspot number of 50, and the rates of change of foF2 and 4000 km MUF factor with sunspot number. The first three parameters use a map presentation with GMT constant over the surface of the map. The fourth parameter uses a chart presentation in which the ordinate is geomagnetic latitude and the abscissa is local time.

Naval Medical Research Inst., Bethesda, Md.
A HIGH-IMPEDANCE INPUT CIRCUIT SUITABLE FOR ELECTROPHYSIOLOGICAL RECORDING FROM MICROPIPETTE ELECTRODES, by E. F. MacNichol, Jr. (Thomas C. Jenkins Labs. of Biophysics) and Henry G. Wagner. Research rept. on Proj. NM 000 019.03.01. 22 Apr 54, 21p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 140 653

Recent interest in the use of intracellular microelectrodes for recording the electrical potential across a cell membrane has introduced a number of technical problems for solution. One of these problems concenrs the development of special input devices that can be inserted between micropipette electrodes and conventional physiological amplifiers. This report discusses circuits in which a very high input impedance can be achieved without loss in speed of response by the use of both positive and native feedback principles. A preamplifier that has been constructed using these principles is described in considerable detail. It has been in use for about a year in neurophysiological investigation and has served to demonstrate the validity of the principles on which its operation was based.

Naval Ordnance Lab., Corona, Calif.
THE THERMERGISTOR: A LOW-ENERGY PULSE-MEASURING DEVICE, by J. C. Chambers and G. R. Bastedo. 3 Apr 59, 11p. NOLC rept. 449; NAVORD rept. 5950.
Order from OTS $0.50 PB 151 686

The "Thermergistor," developed at NOLC, is a device that can reliably measure energy pulses ranging from 10 to 200,000 ergs in electrical circuits. The output of this thermistor-heater assembly is linear and repeatable within 5%. It has been used for developing and testing firing circuits, evaluating firing-circuit components, and investigating undesirable electromagnetic coupling between circuits. A low-impedance Thermergistor is constructed by noninductively winding a short length of resistance wire about a thermistor; a high-impedance Thermergistor, by embedding a thermistor in a composition resistor.

Naval Research Lab., Washington, D. C.
AN EIGHT SPIRAL DOUBLET ELECTROMECHANICAL SCANNING ARRAY, by J. R. Donnellan. Interim rept. 10 Apr 59, 18p. 2 refs. NRL rept. 5283.
Order from LC mi$2.40, ph$3.30 PB 138 312

An array of eight spiral doublets, each doublet consisting of a pair of two-wire spirals in the same plane and wound in opposite senses, is used to scan a beam of horizontal polarization over a ±40-degree range by simple rotations of the spiral doublets. The combination of a microstrip ring network and twin lead provides a balanced feed for each spiral in the array. Side lobe levels are those predicted (25 db) for the broadside pattern and at the test frequency of 1430 Mc are, in general, below 19 db over the 80-degree scan. A novel microstrip feed harness provides isolation between the doublets and serves to absorb most circulating currents. This printed circuit feed structure consists of judiciously grouped microstrip ring networks and provides the desired feeding coefficients to within ±0.1 db. A simple switching mechanism in the feedboard allows two modes of operation: either a main beam or a sharp null between two equal maxima may be directed to a specified angle. The latter mode would be useful for tracking purposes. Future work will include studies of the frequency band of operation and the utilization of vertical polarization.

Naval Research Lab., Washington, D. C.
EXAMINATION OF THE DISCHARGE PATH IN A FLASH TUBE CONTAINING A BETA-RAY-GUN ELECTRODE, by J. W. Tucker. Final rept. 21 Apr 59, 13p. 2 refs. NRL rept. 5284.
Order from LC mi$2.40, ph$3.30 PB 138 313

To test the principle of flash tube discharge guidance by means of high-energy particle trails, two flash tubes were constructed, each containing a beta-ray-gun electrode. Tests were conducted to see if the collimated beta radiation from the strontium-90 source would guide the discharge. The high level of bremsstrahlung gamma and the low beta-ray flux in the beam made it impossible to determine what effect, if any, the beta rays were having. An alpha-ray source is an apparent necessity if gamma radiation and consequent spurious triggering is to be avoided. Tests conducted with inert flash tubes suggest that it will also be necessary to suppress free electrons from other sources if triggering is to occur only on the passage of a beta ray. The addition of a small quantity of an electron-attaching gas might accomplish this.

Naval Research Lab., Washington, D. C.
SIGNAL SUMMING WITH ELECTROLYTIC CAPACITORS, by C. C. Minter. Interim rept. 22 Apr 59, 8p. NRL rept. 5299.
Order from LC mi$1.80, ph$1.80 PB 138 795

A method is described for obtaining the algebraic sum of several low-voltage dc signals. The apparatus consists of a polarized electrolytic capacitor and a double-pole double-throw switch for each signal entering the summation. In one position of the synchronized switches each capacitor is charged while in the other position of the switches the capacitors are connected in series for the summation.

Naval Research Lab., Washington, D. C.
THEORETICAL DESIGN OF PRIMARY AND SECONDARY CELLS. PART I. EFFECT OF POLARIZATION AND INTERNAL RESISTANCE ON CURRENT DENSITY DISTRIBUTION, by Clarence M. Shepherd. 29 Dec 58, 60p. 2 refs. NRL rept. 5211.
Order from OTS $1.50 PB 151 056

The current density distribution in an ideal cell is a function of the electrode height, the grid resistance, the electrolyte resistance, and the polarization. Mathematical solutions have been obtained for those cases where the polarization curves are either linear, logarithmic, cubic, or inverse cubic. A numerical method is indicated for finding a general solution. For practical applications, the use of the complex mathematical calculations involved has been eliminated by presenting the results in simplified graphs which show the current density distributions and other cell characteristics over a wide range of operating conditions. The determination of these cell characteristics can be of considerable importance in cell design.

Naval Research Lab., Washington, D. C.
THE Y- OR JUNCTION-TYPE CIRCULATOR, by H. N. Chait and T. R. Curry. Interim rept. 15 May 59, 9p. 1 ref. NRL rept. 5297.
Order from OTS $0.50 PB 151 633

It is well known that the field distribution in a rectangular waveguide containing a magnetized ferrite can be asymmetrical even though the physical configuration is symmetrical. By properly choosing the ferrite, its shape, and location, it is possible to concentrate the energy on one side of the waveguide. Reversing the field or changing the direction of propagation will cause the energy to concentrate on the other side of the waveguide. This phenomenon has been utilized to construct a new type of circulator.

Navy Electronics Lab., San Diego, Calif.
ANTENNA MODEL STUDIES RELATED TO THE DESIGN OF THE NORTH ATLANTIC VLF TRANSMITTING STATION, by W. E. Gustafson, T. E. Devaney, and N. H. Balli. Research and Development rept. for June 55-1 Mar 58. 19 Dec 58, 27p. 4 refs. NEL/Rept. 884.
Order from LC mi$2.70, ph$4.80 PB 140 555

Model studies of three antenna types — the Goliath, the Trideco, and the Triatic — were conducted as part of a comprehensive vlf systems study conducted in connection with design of a 2-megawatt transmitting station to be built at Cutler, Maine. The straightforward ground system design of the Goliath and Trideco antennas makes them preferable to the Triatic. For economy and ease of maintenance, grounded outer towers and guys are superior to insulated structures. For a given radiated power and efficiency, guyed structures are more economical than unguyed structures. The measurement techniques employed are described in an Appendix.

Navy Electronics Lab., San Diego, Calif.
DEVELOPMENT OF PACORE (PARABOLIC CORNER REFLECTOR) ANTENNA, by J. H. Jensen. Research and Development rept. for Jan 55-July 58. 1 Dec 58, 31p. 5 refs. NEL/Rept. 874.
Order from LC mi$3.00, ph$6.30 PB 140 554

As part of the program for developing lightweight antennas for air search radars, four scale-models and one full-size version of the PACORE antenna were constructed and tested. The full-size antenna was designed for the uhf range and has side and back radiation more than 24 db down over the 400-to-450 Mc band. It does not meet the air search radar requirements for low secondary-lobe levels, but may be useful for wide-band directional communication. The antenna and pedestal weigh less than 500 pounds, and are rugged and compact.

Navy Electronics Lab., San Diego, Calif.
NEL RELIABILITY BIBLIOGRAPHY SUPPLEMENT 2, by W. E. Jorgensen, I. G. Carlson, and C. G. Gros. 1958, 89p. 334 refs.
Order from OTS $2.25 PB 121 838-S1

The pages in this supplement are numbered for interfiling in the appropriate sections of the basic book (PB 121 838). There are ten sections: circuit design; components; electron tubes; failure analysis; general; human engineering; maintenance; mechanical design; systems; and testing.

Navy Electronics Lab., San Diego, Calif.
NOISE GENERATORS FOR SIMPLE RECEIVER SENSITIVITY TESTS, by W. M. Chase and W. E. Gustafson. 11 Aug 55, 13p. 4 refs. Research rept. no. 622.
Order from LC mi$2.40, ph$3.30 PB 140 719

Tests made with vacuum tube and silicon diode types of noise generators showed that they have several advantages over signal generators for measuring the sensitivity of Navy communications receivers.

New York U. Coll. of Engineering, N. Y.
INVESTIGATION AND STUDIES OF MICROWAVE FREQUENCY DIVISION, by D. Cohen. Quarterly progress rept. no. 7, 15 Mar-15 June 53 on Investigation, Studies, and Evaluation of Performance of Crystal Unit Characteristics, Task A, Contract DA 36-039-sc-5493. [1953] 28p.
Order from LC mi$2.70, ph$4.80 PB 140 259

This report contains a continuation of analytic and experimental analysis of techniques for microwave frequency division. Several more models of the series crystal mixer have been constructed for improved high frequency performance. Frequency

doublers to operate from 900 to 1800 mc are under construction and test. The design of these doublers is presented. A preliminary experiment to divide from 9000 to 3000 mc resulted in locked operation between the two frequencies and indicated the feasibility of operation of the external mixer divider from 9000 mc.

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES AND EVALUATION OF PERFORMANCE OF CRYSTAL UNIT CHARACTERISTICS. TASK A. INVESTIGATION AND STUDIES OF MICROWAVE FREQUENCY DIVISION, by D. Cohen. Quarterly progress rept. no. 6, 15 Dec 52-15 Mar 53, on Contract DA 36-039-sc-5493. [1953] 29p.
Order from LC mi$2.70, ph$4.80 PB 140 447

Analysis and experimental study of a locked oscillator divider for microwave frequencies using an external crystal mixer which has its mixed output frequency equal to one of its input frequencies. In the analysis, component requirements for good 2:1 lock are specified. Experimental verification with a locked oscillator divider from 900 to 450 mc is described.

Ohio State U. Research Foundation, Columbus.
ELECTRONIC 400-CYCLE POWER SUPPLY, by Loren E. Bollinger. Rept. on Liquid Rocket Engine Technology, Contract AF 33(616)2078. Feb 55, 50p. 5 refs. WADC TN-56-45; AD-103 603.
Order from LC mi$3.30, ph$7.80 PB 140 575

A variable voltage, 400-cycle power supply has been designed and fabricated for use in the laboratory. The design is electronic in nature. Output from a 400-cycle oscillator stage, after amplification in a push-pull voltage amplifier, is fed into a pair of 807 power amplifier tubes. The attainable output voltage is continuously adjustable from 75 to 150 volts. Approximately 30 watts of output power is available at 115 volts terminal voltage; 65 watts power output can be attained if the series voltage-control tube is not used. Modifications are suggested to convert the basic unit into a three-phase, symmetrical or non-symmetrical power supply. Regulation of the output voltage can easily be added if desired.

Pacific Semiconductors, Inc., Culver City, Calif.
VARIABLE CAPACITOR DIODES, by L. S. Chase and H. D. Frazier. Quarterly progress rept. no. 1, 15 Apr-30 June 58, on Contract DA 36-039-sc-75044. [1958] 45p.
Order from LC mi$3.30, ph$7.80 PB 140 253

The design theory for the AFC and FM modulator type variable capacitance diode is presented in detail while the design theory for the electronic tuning type is deferred for later discussion. The structure of the AFC-FM modulator unit is p^+-n-n^+ fabricated by alloying the p region and diffusing the n^+ region. Processes have been developed and units have been successfully fabricated that have capacitance in the range of 7 to 70 $\mu\mu f$, and Q at 50 mc of 50 or greater. The characterization has proceeded based on capacitance and internal series resistance measurements. These measurements are difficult and cumbersome, since no single instrument will measure the variable capacitance diodes over the required capacitance and Q range. The program for the next interval is based on the investigation for a lower internal series resistance unit coupled with a larger breakdown voltage.

Palmer Physical Lab., Princeton U., N. J.
INVESTIGATION OF THE EFFECT OF GAS COLLISIONS AND OPTICAL PUMPING ON THE BREADTH OF SPECTRAL LINES: MICROWAVE ATOMIC OSCILLATOR USING THE HYPERFINE TRANSITION OF Rb^{87}, by T. R. Carver. Quarterly rept. no. 4 for 1 June-31 Aug 56 on Contract DA 36-039-sc-70147. [1956] 9p.
Order from LC mi$1.80, ph$1.80 PB 140 291

The phase lock klystron stabilization system has been constructed and found to work in a very satisfactory way, enabling the frequency to be controlled and measured to $1:10^8$ and providing even better short term stability. A search for the resonance has started.

RCA Defense Electronics Products, Camden, N. J.
PHILOSOPHY AND GUIDELINES FOR RELIABILITY PREDICTION OF GROUND ELECTRONIC EQUIPMENTS, by H. L. Wuerffel and P. A. Hartshorne. Interim engineering rept. on Contract AF 30(602)1623. 15 Oct 57, 113p. Rept. no. R-4-57; RADC-TN-58-20; AD-148 556.
Order from LC mi$6.00, ph$18.30 PB 140 375

The intrinsic reliability of ground electronic equipments can be predicted by (1) determining the failure rate for each part whose independent failure would result in the effective loss of any one essential function of the equipment, and (2) summing the failure rates for all such parts. The premises and detailed engineering data developed for this technique are included in this report, along with descriptions of other important aspects of reliability improvement and prediction which require further exploration and development.

RCA Labs., Radio Corp. of America, Riverhead, N. Y.
INVESTIGATIONS LEADING TO THE DEVELOPMENT OF TERMINAL EQUIPMENT FOR USE ON AN EXPERIMENTAL METEOR-BURST COMMUNICATIONS LINK, by G. S. Wickizer. Final rept. for 15 Jan-1 Nov 57 on Contract AF 19(604)1522. 5 Nov 58, 5p. AFCRC-TR-59-111; AD-211 151.
Order from LC mi$1.80, ph$1.80 PB 140 415

This report describes, in a general way, activities during the period in which the terminal equipment was developed and put in operation on the experimental meteor-burst radio link from Long Branch, to Riverhead, N. Y. Modifications and operational procedures at the receiving terminal are described and the test results are discussed briefly.

RCA Victor Div., Radio Corp. of America, Camden, N. J.
INVESTIGATION OF LOW FREQUENCY AT-CUT

CRYSTAL PLATES, by E. M. Washburn. Quarterly progress rept. no. 1, 15 Mar-15 June 49, on Contract W36-039-sc-38244. [1949] 33p.
Order from LC mi$3.00, ph$6.30 PB 140 607

It was discovered that crystal vibration patterns could be revealed in a very precise and interesting manner, by coating the crystal with a colored liquid and permitting this liquid to dry while the crystal was oscillating. These patterns are used to show uniformity of crystal orientation, optimum points for mounting and degree of freedom from spurious responses.

RCA Victor Div., Radio Corp. of America, Camden, N. J.
INVESTIGATION OF LOW FREQUENCY AT-CUT CRYSTAL PLATES, by E. M. Washburn. Quarterly progress rept. no. 2, 15 June-15 Sep 49, on Contract W36-039-sc-38244. [1949] 67p.
Order from LC mi$3.90, ph$10.80 PB 140 608

An improved diamond-wheel grinder has been completed and used to produce heavily contoured quartz plates, most of which are .600" outside diameter. This machine has been calibrated to facilitate reproduction of any selected radius of curvature, as required for practical manufacturing purposes. Optimum quartz plate orientation angles have been determined to a reasonable approximation, by running numerous temperature coefficient curves on single response crystals. Very misleading indications were obtained when using crystals having multiple spurious responses. A careful study of surface contouring and diameters of central flat areas revealed data to predetermine these two factors for single response crystals in the range of 500 to 600 KC. (See also PB 140 607)

RCA Victor Div., Radio Corp. America. Camden, N. J.
INVESTIGATION OF LOW FREQUENCY AT-CUT CRYSTAL PLATES, by E. M. Washburn. Quarterly progress rept. no. 3, 15 Sep-15 Dec 49, on Contract W36-039-sc-38244. [1950] 100p.
Order from LC mi$5.40, ph$15.30 PB 140 609

In the production of heavily contoured quartz plates, the diamond wheel grinder is the best process developed and is recommended for frequencies between 500 KC and about 750 or 800 KC. From this range up to 1000 KC, where contours of 18 diopters and under are required, better results and greater freedom from edge chips are obtained with the Harrison optical lap. In fact, this lap or its equivalent is recommended for contoured crystals up to 2000 or 2500 KC for the same size blanks. Both contouring equipments have been described in the first and second quarterly progress reports. (See also PB 140 608)

RCA Victor Div., Radio Corp. of America, Camden, N. J.
INVESTIGATION OF LOW FREQUENCY AT-CUT CRYSTAL PLATES, by E. M. Washburn. Quarterly progress rept. no. 4, 15 Dec 49-15 Mar 50, on Contract W36-039-sc-38244. [1950] 66p.
Order from LC mi$3.90, ph$10.80 PB 140 610

The method of finishing these quartz plates to the pre-etch frequency has been changed to realize greater freedom from spurious responses and to eliminate one variable, thickness, for all crystals of the same frequency. This new process employs a contour lapping technique to replace the former lapping by the Sipp-Eastwood method. In other words, the final lapping to desired frequency is now accomplished by working on the contoured faces instead of on the small, flat, central faces. This process also permits better control of edge thickness, which is important in obtaining minimum effective resistance. (See also PB 140 609)

RCA Victor Div., Radio Corp. of America, Camden, N. J.
INVESTIGATION OF LOW FREQUENCY AT-CUT CRYSTAL PLATES, by E. M. Washburn. Quarterly progress rept. no. 5, 15 Mar-15 June 50, on Contract W36-039-sc-38244. [1950] 48p.
Order from LC mi$3.30, ph$7.80 PB 140 611

This report opens a new phase of crystal unit study which is considered extremely important. For some time it has been recognized that the present CR specification data sheets do not specify the excitation level at which the given limits of performance apply. Obviously, it is far easier to realize low frequency deviations at very low drive levels than under higher excitation conditions which may be more nearly equivalent to actual operating conditions. Hence, this new study is the determination of permissible excitation levels without exceeding a critical value, beyond which the crystal unit suffers a temporary or permanent damage. Considerable work on this subject has been done on lower frequency units, and the first application of that study to these 500 KC to 1000 KC units is given in this report. (See also PB 140 610)

Research Lab. of [Physical Electronics] Tufts [U.] Medford, Mass.
EFFECTS OF THE GEOMETRY OF PIEZOELECTRIC CRYSTAL PLATES. Quarterly rept. no. 5 on Contract W36-039-sc-32379. 30 Jan 48, 8p.
Order from LC mi$1.80, ph$1.80 PB 140 287

Studies of the effect of geometry upon the performance of an osillating crystal plate. Investigations of plates of successively higher contours have continued and the range of cuts is being extended to CT and DT plates.

Research Lab. of [Physical Electronics] Tufts [U.] Medford, Mass.
AN INVESTIGATION OF CERTAIN PROPERTIES OF QUARTZ OSCILLATOR PLATES AS RELATED TO THEIR GEOMETRY. Quarterly rept. no. 4 on Contract W36-039-sc-32379. 15 Nov 47, 81p.
Order from LC mi$4.80, ph$13.80 PB 140 286

Contents:
Crystal mountings and related factors
Rapid-scan spectrometer results
The tensor approach to vibration theory
Temperature-frequency effects in tourmaline

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF TRANSMITTER CONTROL GROUP AN/GRA-30, by George Salton. Apr 59, 11p. RADC-TN-59-103; AD-212 424.
Order from LC mi$2.40, ph$3.30 PB 140 587

This report describes the design and performance of Transmitter Control Group AN/GRA-30 which provides remote ON-OFF control of unattended navigational-aid equipments. The control group utilizes resonant reeds as the frequency-determining elements.

Rome Air Development Center, Griffiss AFB, N. Y.
TECHNICAL EVALUATION OF A BROAD-BAND OMNIDIRECTIONAL ANTENNA, by Edward Malowicki. Jan 58, 44p. 2 refs. RADC TR-57-194; AD-131 390.
Order from LC mi$3.30, ph$7.80 PB 140 342

This report describes a broad-band omnidirectional antenna which operates in the frequency range of 5 to 10 kmc. In azimuth it has a circularity of ± 2 db. In the vertical plane its coverage is approximately cosecant-squared ($\csc^2$), and maximum beam is attained at 22° above the horizon. VSWR is less than 2 in the 5- to 10-kmc range.

Scientific Radio Products, Inc., [Loveland] Colo.
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Elbert M. Shideler. Quarterly rept. no. 1, 1 July - 1 Oct 56, on Contract DA 36-039-sc-73007. [1956] 14p.
Order from LC mi$2.40, ph$3.30 PB 140 576

Progress is reported on work accomplished on the following phases: (1) Fabrication of 50 standard crystal units CR-36/U, frequencies .8 to 5.0 MC-Sec., (2) constructing and installing test equipment necessary to evaluate these units and determine in what respects they do not meet requirements of this contract, (3) preparation to enclose crystal for tests in both glass and metal HC 6/U type holders for comparative tests, (4) commencement of evaluation of the 50 standard CR-36/U crystals, (5) plans for work to be done during next quarter, (6) identification of personnel.

Scientific Radio Products, Inc., [Loveland] Colo.
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Elbert M. Shideler. Quarterly rept. no. 2, 1 Oct 56-1 Jan 57, on Contract DA 36-039-sc-73007. [1957] 53p.
Order from LC mi$3.60, ph$9.30 PB 140 577

Progress is reported on work accomplished on the following phases: (1) Design data of normal CR-36 production units; (2) Methods used to evaluate these units, and difficulties encountered in correlation with respect to measuring the aging characteristics; (3) evaluation of the data obtained and preliminary increased tolerances necessary. (See also PB 140 576)

Scientific Radio Products, Inc. [Loveland, Colo.]
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Jack L. Saunders. Quarterly rept. no. 3 for 1 Jan-31 Mar 57 on Contract DA 36-039-sc-73007. [1957] 28p.
Order from LC mi$2.70, ph$4.80 PB 140 645

Progress is reported on new geometrical design data for precision fundamental mode crystal units. These units are plano-convex allowing orientation measurement after dimensioning. The geometrical designs provide freedom from activity dips over an extended temperature range rather than just over the required range of 10°C., resulting in increased yield in production. Complete data on 4.0 Mc., 4.5 Mc., and 5.0 Mc. are given and approximate design data are given for the 1.0-3.5 Mc. range. The design has been finalized and the component parts are being assembled for the evaporator to be used in plating the precision resonators. The design incorporates a liquid nitrogen cold trap and provides for heating the substrate to 450°C. A 60 Kc. receiver with a narrow band crystal front end filter has been designed and is in the process of construction in order to facilitate the reception of the precise NBS-Boulder transmission which will be used as a precise standard for the measurement of aging.

Scientific Radio Products, Inc. [Loveland, Colo.]
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Donald L. Hammond. Quarterly rept. no. 5, 1 Oct-31 Dec 57, on Contract DA 36-039-sc-73007. [1958] 22p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 140 646

The outline of the second year's investigation of precision fundamental mode crystal units in the frequency range from 5 to 20 Mc. is described. Preliminary design data is given for the two frequencies of 6.5 and 20 Mc. Initial measurements of shock and aging characteristics are discussed. Modifications of processing and testing equipment for the extension of the frequency range are described. Preliminary conclusions are discussed and plans for future studies are given in detail. (See also PB 140 648)

Scientific Radio Products, Inc., Loveland, Colo.
DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Donald L. Hammond and Jack L. Saunders. Quarterly rept. no. 6, 1 Jan-1 Apr 58, on Contract DA 36-039-sc-73007. [1958] 23p.
Order from LC mi$2.70, ph$4.80 PB 140 647

Problems encountered in erratic behavior of the frequency temperature characteristics of fundamental mode resonators in the frequency range of 5.500 Mc. to 20.000 Mc. are described. Apparent limitations of the Bridge system utilized in aging measurements are presented which may be due to the resonator, the system or, in all probability, a combination of both. Preliminary aging data is shown at 7.500 Mc. in which repeatibility of 3-4 parts in 10^8 has been obtained by a method of averaging data. (See also PB 140 646)

Scientific Radio Products, Inc. [Loveland, Colo.] DESIGN AND DEVELOPMENT OF PRECISION FUNDAMENTAL MODE CRYSTAL UNITS, by Donald L. Hammond and Jack L. Saunders. Final rept. for 1 July 56-30 Sep 57 on Contract DA 36-039-sc-73007. [1957] 75p. 8 refs.
Order from LC mi$4.50, ph$12.30 PB 140 648

This report describes the design and development of precision fundamental mode crystal units as well as test procedures and results obtained in measurement of precision fundamental mode crystal units in the frequency range from 1.0 to 5.0 mc. Complete design data, including fabrication techniques, are described. Difficulties encountered in attainment of the required temperature coefficient, shock and vibration characteristics for 1.0 mc crystal units are described. The recommendation is included that further development is necessary before the 1.0 mc unit can be considered a precision fundamental mode crystal unit. Stabilities in excess of 2 parts in 10^7/week in 5.0 mc crystal units were obtained in preliminary aging measurements. However, emphasis is placed on the necessity for further development to improve the aging characteristics. Description of equipments necessary to measure the performance characteristics required under the contract are included. These equipments include a frequency comparison system utilizing the National Bureau of Standards 60 kc transmission as a reference frequency, a bridge system for the precise adjustment of frequency with respect to the crystal resonance frequency, a precise temperature control oven for the measurement of the dynamic frequency-temperature characteristics of the resonators, as well as a multiplier which makes possible the measurements at frequencies from 80 to 100 mc for any of the crystal frequencies from 1.0 to 5.0 mc. Conclusions reached during the first year of the contract are described and recommendations are included for further study. (See also PB 140 645)

Scientific Radio Products, Inc., Loveland, Colo. GLASS ENCLOSED QUARTZ CRYSTAL UNITS, by Donald L. Hammond and C. Robert McKinley. Quarterly rept. no. 2, 15 May-15 Aug 58, on Contract DA 36-039-sc-74999. [1958] 20p.
Order from LC mi$2.40, ph$3.30 PB 140 255

Problems concerning the use of the glass sealing machine in obtaining glass seals consistent with the specification are discussed, and solutions are presented. The major problem encountered is the change in frequency during sealing. Process variations are described which reduce this effect. Crystal units have been sealed which meet the tolerance on nominal frequency. The difficulty encountered in sealing units containing helium is described.

Scientific Radio Products, Inc., Loveland, Colo. GLASS ENCLOSED QUARTZ CRYSTAL UNITS, by Donald L. Hammond and C. Robert McKinley. Quarterly rept. no. 3, 15 Aug-15 Nov 58, on Contract DA 36-039-sc-74999. [1958] 37p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 140 254

Aging data for glass enclosed crystal units with frequencies between 2.0 MC. and 5.0 MC. are presented. It is concluded that an aging specification of 1×10^{-7}/wk. can be met with the crystal unit design developed under the contract. Progress in crystal unit preparation is summarized. Installation and operation of a new R. F. power generator with improved control circuit is discussed in relation to the performance. A test procedure for measurement of internal pressure of the sealed glass unit has been established and is described. (See also PB 140 255)

Stanford Electronics Lab., Stanford U., Calif. APPLICATION OF "COMPARISON OF EXPERIMENTS" TO RADAR DETECTION AND CODING PROBLEMS, by N. M. Abramson. Technical rept. no. 41 on Contract Nonr-225(24). 28 July 58, 90p. 11 refs.
Order from LC mi$4.80, ph$13.80 PB 140 684

"Comparison of Experiments" is the name given to a recently developed topic in statistical decision theory. It deals not with the making of decisions but with the data (or experiment) upon which the decision is based. After a brief discussion of statistical decision theory and comparison of experiments in general, some practical methods are developed for comparing experiments with an infinite as well as a finite number of outcomes. Examples are then given of the application of these methods to radar detection and elementary binary coding.

Stanford Electronics Lab., Stanford U., Calif. SEMICONDUCTOR COMPARATOR CIRCUITS, by G. L. Hoehn, Jr. Technical rept. no. 43 on Contract Nonr-225(24). 28 July 58, 94p. 23 refs.
Order from LC mi$5.40, ph$15.30 PB 140 683

An actual circuit will possess errors in its measurement of amplitude and/or its indication of time because of noise and drift effects. Comparison can only be defined for a finite field of measurement consisting of a prescribed range of time and amplitudes. A certain minimum power is required to meet given specifications on the field and accuracy of comparison; the circuit requiring no greater power is an optimum comparator and is the best realizable circuit. Comparison is a nonlinear operation and a criterion is presented to indicate the degree of nonlinearity, or sharpness, of comparators. This sharpness criterion reveals definite advantages in the use of semiconductor diodes rather than thermionic diodes in comparator circuits. The same criterion indicates that regenerative circuits should perform comparison better than non-regenerative circuits.

Stanford Electronics Labs., Stanford U., Calif. SLALOM INJECTION FOR THE HELITRON OSCILLATOR, by J. L. Jones. Technical rept. no. 46 on Contract Nonr-225(24). 28 July 58, 79p. 8 refs.
Order from LC mi$4.50, ph$12.30 PB 140 678

This study is concerned with a new type of electron beam injection for the helitron oscillator. The helitron, which was invented in 1954 by D. A. Watkins, is a voltage-tuned, backward-wave oscillator in which focusing of the electron beam depends upon a balance between centrifugal force of helical motion and a radial electrostatic field. The new injection mechanism is called slalom injection since the beam is first launched into a path like that of

Slalom-Focusing and then injected from the slalom path into the concentric-cylinder geometry of the helitron. The design of a new electron gun to produce a convergent strip beam is discussed in some detail.

Stanford Electronics Labs., Stanford U., Calif.
A STUDY OF THE ITERATIVE METHOD OF NETWORK SYNTHESIS, by C. Y. Chang. Technical rept. no. 44 on Contract Nonr-225(24). 28 July 58, 98p. 26 refs.
Order from LC mi$5.40, ph$15.30 PB 140 682

This report is intended to introduce and demonstrate some properties of the iterative method of zero-pole network synthesis in the frequency domain, as well as to extend its applications. Maximally flat or equal ripple frequency response approximation is used in illustrations and applications. The philosophy of the iterative method consists of the choice of reasonable starting poles or zeros of a network function corresponding to a designated circuit configuration, and the repeated computation of zeros from poles and vice versa through the use of the realization and frequency response constraints, alternately, until it converges within the desired accuracy.

Stanford Research Inst., Menlo Park, Calif.
END-OF-BURST ERRORS IN METEOR-BURST COMMUNICATIONS, by B. M. Sifford and Irwin Roth. Scientific rept. 11 on Contract AF 19(604)1517. Feb 59, 10p. 11 refs. AFCRC TN-59-143; AD-211 807.
Order from LC mi$1.80, ph$1.80 PB 140 408

A meteor-burst communications system has been established between Stanford, California, and Bozeman, Montana. In one typical three-day study of errors in teletype transmitted over this burst system, 73 percent of the errors occurred in the last character of bursts of usable signal. A technique for identifying and measuring the end-of-burst errors is briefly described. Erasing the last character of each burst and retransmitting it at the start of the next burst is suggested as one remedy for these end-of-burst errors.

Stanford Research Inst., Menlo Park, Calif.
HIGH-STRENGTH PLASTIC LAMINATES FOR USE IN AIRCRAFT H-F ANTENNAS, by H. J. Sang, D. M. Coulson and B. M. Sifford. Final rept. on Contract AF 33(616)2750. June 56, 273p. 20 refs. AD-100 370.
Order from LC mi$11.10, ph$42.60 PB 140 445

Stanford Research Inst., Menlo Park, Calif.
PRELIMINARY 106.1-Mc METEORIC SCATTER EXPERIMENT: STANFORD, CALIFORNIA TO BOZEMAN, MONTANA, by W. R. Vincent and Irwin Roth. Scientific rept. 12 on Contract AF 19(604)1517. Feb 59, 29p. 6 refs. AFCRC-TN-59-159; AD-212 718.
Order from LC mi$2.70, ph$4.80 PB 140 409

Oblique propagation measurements have been conducted over the Stanford-Bozeman path at 106.1 Mc using 50 kw of power, a 61-foot parabolic antenna for transmitting, and a 30- by 30-foot array for receiving. Several graphs are presented showing the angular width and direction of the meteoric "hot spots" or active areas. Diurnal rate and duty cycle data are shown along with duty-cycle vs. decision-level data for early morning and evening hours.

Stanford Research Inst., Menlo Park, Calif.
STRIP TRANSMISSION LINES AND COMPONENTS, by S. J. Cohn, P. M. Sherk and others. Final rept. on Contract DA 36-039-sc-63232. Feb 57, 217p. 42 refs.
Order from LC mi$9.60, ph$33.30 PB 137 860

In the introduction to this report, the background of strip-line techniques is presented briefly, and the advantages and disadvantages of strip line compared to waveguide and coaxial line are discussed. The two major types of strip line, the shielded type and the unshielded type, are described, and it is explained why the Stanford Research Institute program was devoted solely to the first of these. Formulas and design graphs are given for the characteristic impedance, attenuation, and Q of shielded-strip transmission line. A theoretical analysis is given of the coupling between co-planar strips. Formulas and nomogram charts are presented for the characteristic impedances of the basic even and odd modes of propagation on the strips. The information on coupled strips is applied to the design of strip-line directional couplers. Formulas are derived for the design of coupled-transmission-line directional couplers that are rigorous for any value of coupling. A general analysis is given for flat-plate resonators between parallel ground planes. A standing-wave meter for shielded strip line was designed and constructed. An experimental study of strip-line T-junctions was begun during this program, and experimental data are presented for a series of symmetrical junctions having a through-arm characteristic impedance of about 50 ohms, and stub-arm characteristic impedances ranging from about 35 to 100 ohms. A typical strip-line network containing a number of different strip-line components was constructed, and is described in this report. A low-power oscillator was developed using strip-line elements and a pencil-type triode.

Stanford Research Inst., Menlo Park, Calif.
TWISTED YAGI ANTENNAS, by D. K. Reynolds. Scientific rept. 1 on Contract AF 19(604)3502. Dec 58, 26p. 6 refs. AFCRC-TN-59-102; AD-208 048.
Order from LC mi$2.70, ph$4.80 PB 140 402

Uniform traveling-wave antennas, such as the long Yagi, the polyrod, and the corrugated-surface antenna, have useful end-fire radiation characteristics when the axial dimension of the antenna is not too great (less than about 20 wavelengths). The end-fire characteristics may be preserved for even greater lengths if either the amplitude or the phase (or both) of the traveling-wave propagation along the antenna is appropriately modulated. The gradual twisting of the elements of a long Yagi antenna about its central axis is shown in this report to yield some of the same advantages that are gained from other forms of modulation. In addition, circular polarization of the field in the axial direction may be attained. The expres-

sions for the field patterns of the twisted Yagi are derived, and compared with measured patterns taken on a ten-wavelength model.

Sylvania Electric Products, Inc., Bayside, N. Y.
WIDEBAND OSCILLATOR TUBES. Interim engineering rept. no. 3, 1 July 57-31 Mar 58, on Contract DA 36-039-sc-73147. [1958] 26p. 2 refs. Rept. YD-57-3-3.
Order from LC mi$2.70, ph$4.80 PB 140 597

The purpose of this program is the further development of 17 to 27 and 26.5 to 41 kMc backward wave oscillators. Because of certain tube application requirements it was also requested that the lower frequency tube be changed to operate over the 15 to 24 kMc band. The primary objective of the present program is to modify the tubes such that permanent magnet focusing is feasible with a magnet of thirty pounds weight or less.

Sylvania Electric Products, Inc., Bayside, N. Y.
WIDEBAND OSCILLATOR TUBES. Interim engineering rept. no. 4, 1 Apr-31 July 58, on Contract DA 36-039-sc-73147. [1958] 9p. Rept. YD-57-3-4.
Order from LC mi$1.80, ph$1.80 PB 140 598

One 17 to 27 kMc and one 26.5 to 41 kMc tube has been completed. The remaining phase of the program is the development of a tube having a tuning range of 23.5 to 38 kMc. (See also PB 140 597)

Syracuse U. [Research Inst.] N. Y.
DETERMINATION OF ANTENNA GAIN MEASURED RADIATION PATTERNS, by Jacob S. Brown. Final rept. on Contract AF 30(602)300. 30 Sep 53, 66p. 12 refs. [RADC TR-54-25] AD-27 537.
Order from LC mi$3.90, ph$10.80 PB 140 429

Various methods of computing directive gain are described. The principles of each method and the sources of error are discussed. Appendixes are included which consider principles, approximations, errors in measurement of angles, and antenna data.

Syracuse U. Research Inst., N. Y.
TRANSISTOR CIRCUIT APPLICATIONS; A STUDY OF TRANSISTOR VIDEO AMPLIFIERS, by Herbert Hellerman and Carl Zimmer. Final rept. on Contract AF 30(602)929. 1 Nov 56, 130p. 14 refs. SURI rept. no. EE278-5611F; RADC TR-57-73; AD-114 414.
Order from LC mi$6.30, ph$19.80 PB 140 370

Technical Research Group, Somerville, Mass.
MICROWAVE STUDIES IN VARIABLE INDEX LENSES, ELECTRONIC SWITCHING AND EFFECTIVE MUTUAL COUPLING ON SLOT ARRAYS, by Alan F. Kay and Alan J. Simmons. Final rept. for 15 May-15 Dec 58 on Contract AF 19(604)4054. 4 Feb 59, 29p. 7 refs. AFCRC TR-59-112; AD-211 152.
Order from LC mi$2.70, ph$4.80 PB 140 452

Results on the following three unrelated items are described: (1) a. The difference in mutual coupling effects between half wave length and resonant length slots in the broad face of rectangular waveguide was examined and found practically negligible. b. The effects of mutual coupling on low side lobe slot array patterns were calculated in three typical cases. (2) Electrical design formulae for monostatic and bistatic backscattering lenses were derived. The effects of index tolerances in these lenses were determined. Associated electrical design problems were considered. (3) Operational techniques for electronically scanning multiple feed antenna systems were considered, including switch components and switching requirements, arrangements, and networks.

Upper Air Lab., U. of Colorado, Boulder.
AUDIO-FREQUENCY NOISE FIGURES OF PNP ALLOY-JUNCTION GERMANIUM TRANSISTORS, by Frank E. Stuart. Scientific rept. no. 2 on Contract AF 19(604)1899. Jan 59, 92p. 8 refs. AFCRC-TN-59-224; AD-210 489.
Order from LC mi$5.40, ph$15.30 PB 140 319

This report presents the results of audio-frequency noise figure (NF) measurements on several hundred alloy-junction PNP germanium transistors. Two types of measurements were made: (1) "Broad band" measurements, in which the band width of the apparatus was about 775 cps, centered at 300 cps; (2) Narrow-band measurements in which a General Radio wave analyzer was used to provide a variable pass-band with a bandwidth of approximately 4 cps. A theoretical model of a transistor with noise is described, and constant-NF contours derived from this model are compared with experimental results.

Utah U., Salt Lake City.
FEASIBILITY OF THE ELECTROMAGNETIC ACCELERATOR, by W. S. Partridge, L. D. Harris and others. Technical rept. no. OSR-14 on Contract AF 18(600)1217. [1958] 124p. 10 refs. AFOSR TN-58-517; AD-158 330.
Order from LC mi$6.30, ph$19.80 PB 136 075

An investigation of the feasibility of an electromagnetic device to accelerate small projectiles to velocities of 10 kilometers per second was started in July 1955. Since that time, many schemes have been studied and several reports have been issued. This report is a review of the most important efforts of this project.

Vibration Research Labs., Inc., Tuckahoe, N. Y.
MAKE-BEFORE-BREAK VIBRATORS AND ASSOCIATED POWER SUPPLIES, by Thomas W. Smith. Final rept. for 15 Jan 56-15 Apr 57 on Contract DA 36-039-sc-71170. [1957] 100p. AD-137 702.
Order from LC mi$5.40, ph$15.30 PB 140 660

Development is reported on a make-before-break vibrator structure and the incorporation of this vibrator in basic make-before-break vibrator power supply circuits, and the evaluation of the performance of the vibrator in these circuits. Timing stability requirements imposed on the make-before-break vibrator to assure

proper circuit operation are not met by the earlier model S-204-B vibrator, and the driving power requirements of this vibrator were excessive. Tests of a balanced-armature driven vibrator, VRL model S-271-BX, indicated that the timing accuracy and stability are sufficient for use in heavy power make-before-break cirucits. Model S-271-BX vibrator is used in the type B power supply called for in the requirements. In lower power requirements (less than about 100 w), the standard series drive system may be used effectively; since less contact mass and preloading force is required. A small series-drive vibrator, with Ag overlay, spring steel strips as the contacts, was designed and found suitable for use in the type A power supply. The type B power supply displays dc to dc conversion efficiency of about 85% for outputs of 500 to 600 w and 1000 v dc, from an input of 28 v dc. Current handled by the contacts at make is around 10 to 20 ma, and the voltage across the breaking contact pair is about 1 to 2 v. The expected life of the supply under full load conditions is estimated to be over 2000 hr. The type A power supply delivers about 46 w of output at 385 v dc and 20 w at 225 v dc at a dc to dc conversion efficiency of 80% from 6.5 input. The make and break energies at the contacts are about one half of those in the type B supply. The life of type A supply is expected to be somewhat longer than that of the type B supply.

Virginia U. Engineering Experiment Station, Charlottesville.
MASER FOCUSER AND NOZZLE STUDY, by K. L. Haynes. Quarterly progress rept. no. 1, 1 July-31 Sep 56, on Contract DA 36-039-sc-73041. 22 Oct 56, 10p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 140 652

The design of a supersonic molecular beam nozzle is described which is expected to produce a beam of 10^{14} molecules/sec. intensity and less than one degree divergence. An experimental model of this nozzle is now being build. A systematic plan for the study of focuser designs is given and is in progress. The construction of apparatus and measuring equipment is related.

Virginia U. Engineering Experiment Station, Charlottesville.
MASER FOCUSER AND NOZZLE STUDY, by R. L. Ramey, K. L. Haynes and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 57 on Contract DA 36-039-sc-73041. 30 Apr 57, 61p. 6 refs. AD-133 267.
Order from LC mi$3.90, ph$10.80 PB 140 673

A complete summarization of the quantum mechanics of ammonia is followed by the design calculations for a disk focuser. The calibration of the Stern-Pirani beam density distribution gauge is described. (See also PB 140 674)

Wesleyan U., Middletown, Conn.
PIEZOELECTRIC CRYSTAL STUDIES AND MEASUREMENTS, by Karl S. Van Dyke. Quarterly rept. no. 2, 1 May-31 July 53, on Contract DA 36-039-sc-42587. 7 Sep 53, 18p.
Order from LC mi$2.40, ph$3.30 PB 140 206

Computations of the theoretical strain distribution for AT-cut quartz plates of certain dimensions by the Mindlin analysis.

Westinghouse Electric Corp., Baltimore, Md.
EXPERIMENTAL HIGH-POWER UHF LINK. Rept. no. 16 (Progress) for Feb 57 on Contract AF 30(602)1256. Mar 57, 11p. RADC TN-57-164; AD-114 439.
Order from LC mi$2.40, ph$3.30 PB 136 685

During this period, an unmodulated carrier was transmitted between the hours of 5 P.M. and 8 A.M. the following morning, for the purpose of continuing the recording of the hourly median signal level at the Baltimore, Maryland receiving site. During the hours of 8 A.M. to 5 P.M., various forms of modulation were applied to the transmitter through the order-wire portion of the AN/TCC-7 multiplex equipment.

Mechanical Engineering

Bureau of Yards and Docks, Washington, D. C.
BASIC MECHANICAL ENGINEERING. Rev. Oct 57, changed 19 June 58. 112p. Technical pub. NAVDOCKS TP-Te-4; BUDOCKSINST 11300.10A AND 11300.10A CH 1.
Order from OTS $2.50 PB 151 693

Specific basic mechanical information is presented on design requirements and installation of plumbing, heating, ventilating, air-conditioning, refrigerating, and dehumidifying systems, and on elevator equipment. Information concerning maintenance and operation requirements in these areas is not included.

Johns Hopkins U., Baltimore, Md.
FLEXURAL VIBRATION OF ORTHOGONALLY STIFFENED CIRCULAR AND ELLIPTICAL PLATES, by W. H. Hoppmann II. Technical rept. no. 3 on Contract DA 36-034-ORD-2381. Nov 57, 24p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 140 631

A study of the nodal patterns and frequencies of vibration of stiffened circular and elliptical plates is presented. Some vibration results are also presented for unstiffened uniformly thin plates of aluminum. The differential equation of flexual vibration of a plate of orthotropic material is developed in polar coordinates.

Watertown Arsenal Labs., Mass.
TESTING FOR NOTCH SENSITIVITY IN WELDED JOINTS, by Carl E. Hartbower. Aug 58, 24p. 21 refs. Rept. no. WAL TR 648/12.
Order from OTS $0.75 PB 151 630

The main problem in testing weld heat-affected zone is the steep gradient of structures present. Various approaches to the problem of weld-joint evaluation are reviewed, and a method of accomplishing this evaluation is described.

Air Force Missile Development Center, Holloman AFB, N. Mex.
ON SATELLITE ORBITS, by Herbert Knothe and Richard H. Anderson. Apr 59, 19p. AFMDC TR-59-11; AD-211 523.
Order from LC mi$2.40, ph$3.30 PB 140 318

In this report some simple derivations are given of fundamental formulas concerning the behavior of the angular momentum vector and apogee and perigee motion of a satellite under the influence of a non-spherically symmetric earth.

[Army] Signal [Research and Development] Lab., Fort Monmouth, N. J.
THE EFFECT OF RADIO WAVES ON ELECTRICAL BLASTING, by Frank J. Triolo and Helmut Brueckmann. Aug 53, declassified 13 Feb 54. 53p. 5 refs. Technical memo. no. M-1525; AD-19 504.
Order from LC mi$3.60, ph$9.30 PB 140 232

To investigate potentialities of premature detonation of typical electrical blasting circuits by radio transmission. To make recommendations for proper instruction of field personnel to minimize the danger of premature detonation of electrical blasting circuits under field conditions.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EMPIRICAL FORMULAS FOR THE NORMAL FORCE COEFFICIENT OF AXISYMMETRIC PROJECTILES IN SUBSONIC FLIGHT, by H. P. Hitchcock. Jan 59, 15p. 11 refs. Rept. no. 1064.
Order from LC mi$2.40, ph$3.30 PB 140 591

Using data from free flight firings, empirical formulas for estimating the normal force coefficient and center of pressure of axisymmetric projectiles in subsonic flight have been devised. These formulas include effects of Mach number, fineness ratio, head height, boattailing, and hemispherical base.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
FLIGHT INFORMATION AND EXPERIMENTAL RESULTS OF NIKE-CAJUN ROCKET OB6.02; UPPER ATMOSPHERE RESEARCH REPORT NO. VI, by S. T. Marks and E. J. Pybus. Jan 59, 31p. 3 refs. Memo. rept. no. 1190.
Order from LC mi$3.00, ph$6.30 PB 140 589

A Nike-Cajun rocket firing for the purpose of carrying a magnetometer experiment to an altitude of 140 km is described. Flight objectives are enumerated. The rocket units and nose cone instrumentation are described in some detail. The performance of the rocket is discussed. The magnetometer data were lost due to a power supply failure. However, a measurement of the electron density in the ionosphere has been accomplished by comparing the DOVAP trajectory with a vacuum trajectory, and the results are compared with independent data.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD FOR SEQUENTIAL TRIGGERING OF MULTIPLE FLASH X-RAY UNITS, by George M. Reynolds. Feb 59, 19p. 3 refs. Memo. rept. no. 1195.
Order from LC mi$2.40, ph$3.30 PB 140 771

This report described a system that permits electronic control for predetermining firing times of the individual units in a multiple flash radiograph setup in the field. In addition, accurate measurements of the inconsistent time delays that occur in an x-ray tube and its associated circuitry may be made, thereby greatly reducing the error in time - space measurements of the shaped charge jet. With this instrumentation, verification of shaped charge theories may be carried out in the field.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SUMMARY OF ELECTRONIC SATELLITE TRACKING OPERATIONS FOR SOVIET SATELLITES 1957 ALPHA-2 AND 1957 BETA. HIGH ALTITUDE INSTRUMENTATION REPORT NO. 1, by Raymond E. Prenatt, Bedford T. Bentley and L. G. de Bey. Oct 58, 43p. Memo. rept. no. 1174.
Order from LC mi$3.30, ph$7.80 PB 140 428

Radio transmissions from the two Soviet Satellites (1957 Alpha-2 and 1957 Beta) were monitored by the Ballistic Research Laboratories. A brief description of the instrumentation system is presented. Radio doppler and interferometer data were taken for 1957 Alpha-2 and doppler data were taken for 1957 Beta. Slant ranges, pass times, and, for 1957 Beta, transmitter frequencies were determined from the data. Variations in signal strength that frequently occurred are described and possible explanations of their cause are mentioned. Methods of reducing the data are discussed. A procedure for determining the times during which the satellite is visible is developed and two methods of determining satellite position from two monitoring stations are derived.

Ballistic Research Labs.,Aberdeen Proving Ground, Md.
SYMPATHETIC DETONATION IN COMPOSITION B INDUCED BY AIR SHOCK FROM PENTOLITE AND FROM COMPOSITION B, by Gertrude R. McVey and Vincent M. Boyle. Nov 56, 17p. 4 refs. Memo. rept. no. 1048.
Order from LC mi$2.40, ph$3.30 PB 138 669

A study was made of the detonation induced in an explosive receptor by air shock from an explosive donor. Composition B and pentolite were used as donor charges for composition B receptor charges. Pressures and induction times were measured at the face of the receptor and the results are presented.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
HEAT REFLECTING AND INSULATING COATINGS FOR ROCKET MOTORS, by Melvin H. Sandler. 17 Apr 59, 8p. 1 ref. Rept. CCL #75.
Order from LC mi$1.80, ph$1.80 PB 140 231

This investigation covers a study of the reflective and insulative properties of several specification paints and other type coating materials for possible use as insulator coatings for rocket motor bodies. A group of coatings applied to steel test specimens were subjected to an infrared heat source and evaluated for rate of heat adsorption by recording the surface temperature of the metal. Test data showed that an aluminum coating conforming to Military Specification MIL-P-14276(Ord) will keep the temperature 40-50 degrees F. lower than unpainted metal, 100-120 degrees lower than metal painted olive drab, and 30-45 degrees lower than metal painted white.

Feltman Research and Engineering Labs., Picatinny Arsenal, N. J.
INTERIOR BALLISTIC CALCULATIONS WITH SPECIAL SLIDE RULE, by Sidney Kravitz. Apr 59, 29p. 6 refs. Technical rept. 2603; AD-208 861.
Order from LC mi$2.70, ph$4.80 PB 140 233

A special slide rule was designed and constructed which will quickly and easily perform certain interior ballistic calculations. The theory, design, and operation of this slide rule are explained in this report.

Frankford Arsenal, Philadelphia, Pa.
THE PRODUCTION OF THIN WALLED SHAPE CHARGE LINERS BY THE DIE CASTING PROCESS, by L. M. Smith. Feb 59, 29p. Technical rept. no. R-1489.
Order from LC mi$2.70, ph$4.80 PB 140 553

Procedures were developed for the die casting of shaped charge liners for Rocket, HE, AT, 3.5 inch, M28A2. Cones were die cast in one zinc and two aluminum die casting alloys. In the aluminum alloys, cones were produced with wall thicknesses of 0.100, 0.130, and 0.160 inch so that an evaluation of the effect of mass on the ballistic performance could be made. Mechanical property data appear inconclusive because of the geometry of the test specimens. Radio graphic and metallographic examinations showed that the casting were sound. The dimesnional tolerances set forth in the applicable drawings were met.

Massachusetts Inst. of Tech., Cambridge.
CORRECTION OF EPOCH ERROR IN CIRCULAR ORBITS. PART I. CORRECTION BY TANGENTIAL TRANSFER, by Lawrence J. Berman. Rept. on Cn Contract AF 49(638)363. 5 Feb 59, 10p. AFOSR Technical note 59-62; AD-209 494.
Order from LC mi$1.80, ph$1.80 PB 140 450

The motion of a body in space can be characterized by six parameters. Two parameters denote the orientation of the orbital plane and one the direction of line of apsides within this plane. Two more parameters define the size and shape of the orbit. The sixth parameter locates the body in the orbit at any given time. The general problem of matching orbits involves corrections in all six of the above parameters and is a very complex problem. It is of use, however, to consider the correction of each of these parameters individually, assuming the other five to be correct. In this paper it is assumed that the size, shape, and orientation of the orbit are correct and only the sixth parameter, the epoch, is in error.

[Material Lab.], New York Naval Shipyard, Brooklyn.
QUALIFICATION INSPECTION OF TYPE I MISSILE TESTING RECTIFIER TYPE POWER SUPPLY MANUFACTURED BY ADLER ELECTRONICS, INC., NEW ROCHELLE, N. Y. Supplementary rept. 10 Oct 58, 4p. 2 refs. Lab. project 5986-1.
Order from LC mi$1.80, ph$1.80 PB 140 485

Naval Ordnance Lab., Corona, Calif.
DEVELOPMENTAL TESTING AND EVALUATION OF A TEAR-STRIP INNER STORAGE CONTAINER FOR A GUIDED MISSILE ORDNANCE DEVICE, by J. L. Day. 18 Feb 59, 33p. NOLC rept. 434; NAVORD rept. 5938.
Order from OTS $1.00 PB 151 672

To determine what modifications in the design of an existing tear-strip inner storage container would be necessary to insure that it would provide satisfactory protection for a guided missile ordnance device, specimen containers were subjected to MIL-STD-355 vacuum-steam-pressure tests and MIL-STD-303 transportation-vibration tests. Results of these tests pointed the way to design improvements both in this container and in other tear-strip containers. Test procedures are described, and results and conclusions are presented.

North Carolina State Coll., Raleigh.
A STUDY OF THE INTERIOR BALLISTIC EQUATIONS, by Raymond A. Struble. Rept. on Contract DA 36-034-ORD-2733. Jan 59, 32p. 8 refs. AD-211 947.
Order from LC mi$3.00, ph$6.30 PB 140 739

A system of nonlinear differential equations, typical of the interior ballistics equations for orthodox guns, is studied. Characteristics of the mathematical pressure curves are obtained for the entire spectrums of the ballistic parameter, burning exponent, and geometric parameter (characteristic of the form function). The mathematical solutions are found to distinguish sharply between regressive and progressive burning geometries and a constant pressure solution is obtained (a piezometric efficiency of one) for what is defined as the ideally progressive geometry. The validity of isothermal solutions, established by Clemmow for a linear burning law, is extended to the general case.

Rock Island Arsenal Lab., Ill.
INVESTIGATION OF GLASS FOR RECOIL MECHANISM CYLINDER COATINGS, by L. R. Raisbeck. 12 Nov 57, 28p. 2 refs. Rept. no. 57-2695.
Order from LC mi$2.70, ph$4.80 PB 140 199

Friction and wear properties were determined for glass, chromium plate and uncoated alloy steel in sliding contact with leather, Teflon, aluminum alloy and silver. Oils were used for lubrication. Tests were conducted at normal room temperature using a load of 500 psi and a velocity varying from 0 to 4 inches per second.

Rock Island Arsenal Lab., Ill.
INVESTIGATION OF ROCKET GUIDE SHOE MATERIALS, by F. K. Blessin. 7 Aug 57, 55p. 2 refs. Rept. no. 57-1968.
Order from LC mi$3.60, ph$9.30 PB 140 198

Sixteen proposed rocket shoe materials were tested in sliding contact with uncoated and coated aluminum launcher guide rail material. Tests were made at speeds of 155 to 185 feet per second and ambient temperatures of 80 F, 140 F and minus 40 F, using loads of 600, 800 and 1500 psi. No lubrication was used.

Rodman Lab., Watertown Arsenal, Mass.
POWDER METALLURGY MANUFACTURE OF SMALL ARMS COMPONENT, by James E. Mahaffy. Dec 58, 18p. 3 refs. Rept. no. RPL 41/4.
Order from LC mi$2.40, ph$3.30 PB 140 557

The back plate latch, a component of the caliber .50 machine gun (.50 MG-M3 AC) was produced from powdered metal. A fabrication process to achieve high physical properties, feasible for an industrial manufacturing operation, was determined by trial sintering of high purity iron powder over a range of temperatures from 1967° F (1075° C) to 2417° F (1325° C) for times of one and two hours.

Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF SATELLITE SPIN ON GROUND-RECEIVED SIGNAL, by J. T. Bolljahn. Technical rept. no. 6 on Contract DA 04-200-ORD-273. Aug 57, 26p.
Order from LC mi$2.70, ph$4.80 PB 140 210

This report presents an analysis of those characteristics of the radio signal received on the ground from the artificial earth satellite which are caused by satellite spin. It is shown that if the spin axis of the satellite does not coincide with the axis of symmetry of the satellite antenna system, a CW transmitted signal will be split into three closely spaced spectral components. The relative amplitudes of the three spectral components are calculated for various combinations of satellite antenna type, ground antenna type, antenna observation angle, and angle between the spin axis and antenna symmetry axis of the satellite, and the significance of these results is discussed.

Watertown Arsenal Lab., Mass.
EFFECTS OF SEVERAL IMPREGNANTS ON THE OXIDATION RESISTANCE OF GRAPHITE, by P. T. Whelan. Technical rept. on Research, Rocket Motors, Launchers, and Jatos. Nov 57 [21]p. 10 refs. WAL TR 371/49; AD-149 513.
Order from OTS $0.75 PB 151 575

The effects of impregnating graphite with the oxides and carbides of silicon, zirconium, boron, and chromium on its high-temperature oxidation characteristics were investigated. All of these impregnants reduced the oxidation rate except the carbide and oxide of chromium, which increased it. The impregnation was accomplished by quenching the heated graphite into a prepared solution. The data show that impregnation of graphite with the following materials is effective in promoting oxidation resistance in a decreasing order: (1) silicon carbide, (2) zirconium carbide, (3) boron oxide, (4) silicon dioxide, (5) zirconium dioxide, (6) boron carbide. With silicon carbide it was found that multiple quenching, up to three, improves oxidation resistance.

Watervliet Arsenal, N. Y.
IMPROVED BENCHING METHODS, by Millard T. Douglas and Helmut J. Hagg. 5 Nov 57, 33p.
Order from LC mi$3.00, ph$6.30 PB 140 714

This report details some of the problems which were overcome in benching operations and assembly of gun components, especially on the 106 mm M40 Recoilless Rifle.

Watervliet Arsenal, N. Y.
PLATING OF LEAD TO 90m/m CHROME PLATING ANODE, by Millard T. Douglas, June 58, 16p.
Order from LC mi$2.40, ph$3.30 PB 140 712

A process for the continuous lead plating of round copper bars, 2" in diameter, 17'6" in length for producing chrome plating anodes. The lead plating results in anodes having greater chrome plating accuracy and increased life.

Watervliet Arsenal, N. Y.
REDESIGN OF 106mm VENT, by Millard T. Douglas. Nov 57, 32p.
Order from LC mi$3.00, ph$6.30 PB 140 715

The object of the project was to redesign the 106mm Recoilless Rifle Vent so that it can be produced in quantity, in the shortest possible time, with a minimum of tooling. Special emphasis has been placed on: (1) Change of design. (2) Savings in machining and benching time. (3) Comparison costs of tooling required. (4) Test Results - Proof Firing. (5) Simplicity of production.

White Sands Missile Range, N. Mex.
METHODS OF ERROR ANALYSIS IN TWO DIMENSIONS, by Thomas W. Schmidt and Martha M. Hayes. 20 June 58, 25p. Range Instrumentation Development Div. Special rept. on OOR Project I-170-M.
Order from LC mi$2.70, ph$4.80 PB 140 530

This report outlines methods of analyzing errors in two-dimensional position determination systems using the ellipse of error concept and illustrates these methods for a two-station distance measuring system and a two-station angle measuring system.

White Sands Proving Ground, N. Mex.
TEST OF INTERIM CELLULAR STRUCTURE FOR NIKE HERCULES. Jan 58, 112p. Technical memo. 488.
Order from LC mi$6.00, ph$18.30 PB 140 197

The interim cellular launching facility was designed for deployment of the Nike Hercules System with minimum real estate and man power requirements. This test was conducted to evaluate structural design, site requirements, and protection to personnel and missile system components. The launching facility did not provide sufficient protection to missile system components in a cell adjacent to one in which a missile was fired. It is recommended that the design of the Interim Cellular Launching Facility be modified to provide adequate protection to missile system components located on adjacent launchers.

Sanitation and Safety Engineering

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
REMOVAL OF RADIOACTIVE CONTAMINANTS FROM WATER WITH THE CORPS OF ENGINEERS MOBILE WATER-PURIFICATION UNIT, "SALTY DOG IV", by Don C. Lindsten, William J. Lacy and others. 27 May 55, declassified 22 Mar 56. 23p. Rept. 1406.
Order from LC mi$2.70, ph$4.80 PB 135 996

The Mobile Water-Purification Unit is capable of removing 84 to 88 percent of 2-month-old fission products from water when operated according to the normal procedure of coagulation and diatomite filtration, 93 percent when operated with clay pretreatment followed by the normal procedure of coagulation and diatomite filtration, and over 99.9 percent when operated with a mixed-bed ion exchange post-treatment following the normal procedure of coagulation and diatomite filtration. Ion exchange is a significant and important auxiliary processing step that could be used by the military for removing radioactive materials from water.

Bureau of Yards and Docks, Washington, D. C.
WATER SUPPLY SYSTEMS. 1 Feb 54, 116p. 7 refs. Technical pub. NAVDOCKS TP-Pw-12.
Order from OTS $2.50 PB 151 616

Ship Building

Alloy Engineering and Casting Co., Champaign, Ill.
PROPELLER CASTING PROCESS WITH SPECIAL REFERENCE TO CASTING CORROSION RESISTANT STEELS, by H. H. Harris. Final rept. on Contract NObs-5208. [1951] 168p.
Order from LC mi$7.80, ph$27.30 PB 140 723

Contents:
Engineering Section. Casting process, metal structures and physical properties; technology and controls in the foundry; test procedures of section-structure; theory-tied-to-practice of casting metal in propeller forms.
Casting Process Section. Procedures, tooling and machines; alternative employment of fired and unfired ceramics and conventional mold materials.
Ceramic Section. Processes and background material on ceramic molds, mold components and ceramic gating.
Background Material.

Bureau of Yards and Docks, Washington, D. C.
DRYDOCKING FACILITIES. VOL. I. DESIGN CONSTRUCTION, AND OPERATION. 14 Jan 57, 327p. 91 refs. Technical pub. NAVDOCKS TP-Pw-10; BUDOCKSINST 11420.7.
Order from OTS $5.00 PB 151 758

This publication, issued in four volumes, presents the current policies, practices, criteria, and technical data used by military and civilian personnel concerned with the Navy's drydocking facilities. Volume 1 deals with the major subjects of design, construction, and operation of drydocking facilities. Related subjects also included in Volume 1 are planning, procurement, overhaul, reports and records, alteration, activation, inactivation, safety, fire protection and prevention, security, and towing, mooring, and outfitting of floating drydocks.

Bureau of Yards and Docks, Washington, D. C.
DRYDOCKING FACILITIES. VOL. 2. MAINTENANCE AND INSPECTION. 14 Sep 56, 333p. Technical Pub. NAVDOCKS TP-Pw-10; BUDOCKSINST 11420.6.
Order from OTS $5.00 PB 151 759

This publication, issued in four volumes, presents the current policies, practices, criteria, and technical data used by military and civilian personnel concerned with the Navy's drydocking facilities. Volume 2 covers the inspection and maintenance of drydocking facilities. (See also PB 151 758)

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
FOIL PACK MEAL GUIDE (INCLUDING RECIPES AND ASSOCIATED EQUIPMENT) by Dorothy Ballentine. Rept. on Equipment for Feeding In-Flight. Apr 55, 54p. WADC Technical rept. 55-183; AD-74 090.
Order from OTS $1.50 PB 151 792

These recipes have been developed on an individual foil pack basis specifically geared to the special problems in foil packaging and subsequent cooking in aircraft B-4 ovens. Food preparation directions are explained in detail so that procedures are easy to follow and so that cooking results are consistent.

Food proportions in reference to food quantity and moisture content have been tested to obtain optimum results within the limits of oven shelf heat variations and altitude effects. Standard measurements are used in all cases. Optimum pre-preparation cooking times have also been established to insure thorough cooking aloft during the 30 minute cooking cycle of the B-4 oven. The report also contains applications of an indented foil pack which was found to be an improvement for foods which would otherwise scorch in B-4 oven cooking. In developing acceptable eggs for breakfast, this pack was a necessity. In addition, this report includes preliminary ordering guides for foods, preparation implements, foil packs and accessories. Fifty lunch or dinner menus plus ten breakfast menus are incorporated.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
LIQUID DIETS FOR USE IN HIGH-ALTITUDE, HIGH-PERFORMANCE VEHICLES, by Beatrice Finkelstein and Bernice McGee. Rept. on Physiology of Flight, Mar 59, 25p. 4 refs. WADC Technical rept. 59-32; AD-209 064.
Order from OTS $0.75 PB 151 786

The Aero Medical Laboratory, in its search for significant life sciences information which will enable crews of high-altitude, high-performance vehicles to function efficiently, recently conducted the preliminary phase of a liquid diet evaluation. Fifteen males, ranging in age from 21 to 29 years, participated in the study for a 5-day period while performing their usual laboratory activities. Food consumption was controlled by serving meals consisting of 2 or 3 beverages in the nutrition laboratory. Fruit juices and a chocolate drink were made available for between-meal snacks. Each day's meals provided approximately 2600 calories and 115 grams of protein. Criteria used to evaluate the diet included food consumption records, acceptability data, physiological effects, and psychological changes. Preliminary data indicate that a high protein liquid diet will be acceptable for crews flying high-altitude, high-performance vehicles for extended periods of time and will induce no adverse effects.

American Machine and Foundry Co., New York.
EVALUATION OF RADIATION-PROCESSED POTATOES UNDER COMMERCIAL HANDLING CONDITIONS, by W. E. Chamberlain, Joseph Silverman and others. Rept. no. 5 (Final) for 1 Dec 55-30 June 57. 1957 41p. QFCIAF File no. S-707.
Order from LC mi$3.30, ph$7.80 PB 140 300

Potato procurement, irradiation, shipping and handling information are described. Data on storage, plant physiology, and nutritive value are presented. Results of commercial processing tests and a preliminary analysis of the potential impact of radiation preservation on the potato industry are also given.

Army Medical Nutrition Lab., Denver, Colo.
THE DETERMINATION OF METABOLIZABLE CARBOHYDRATE IN FOODS. II. DETERMINATION OF REDUCING SUGARS AFTER ACID AND ENZYMATIC HYDROLYSIS, by Theodore E. Friedemann, Howard K. Cahall and others. 8 July 58, 41p. 71 refs. Rept. 225.
Order from LC mi$3.30, ph$7.80 PB 140 337

An enzymatic procedure was developed, consisting of digestion of the sample with a saccharolytic enzyme preparation, followed by determination of the resulting monosaccharoses. A second procedure was developed consisting of hydrolysis by N HCl.

California U., Davis.
PREPARATION AND STORAGE STABILITY OF DEHYDRATED PRECOOKED MEATS, by A. L. Tappel. Rept. no. 9 (Final) for 6 Jan 56-5 June 57 on Contract DA 19-129-qm-558. [1957] 12p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 140 742

Precooked freeze-dried beef, pork, veal, lamb, chicken, turkey, salmon, tuna, shrimp and oysters were prepared. The time required for freeze-drying was mainly a function of thickness. Rehydration in 212°F water at atmospheric pressure was poor. Some of the meats, poultry, and seafoods had good organoleptic properties and most of them were stable for six months storage at 70°F. and 100°F. Samples stored at 130°F. developed a desirable flavored browning during the first two months and began deteriorating thereafter. The water vapor equilibria of precooked freeze-dried beef and pork is favorable for freeze-drying and use of inpackage desiccation.

Michigan U. [Research Inst.] Ann Arbor.
COMBINED USE OF HEAT AND RADIATION TREATMENT FOR STERILIZATION OF FOODS, by Lloyd L. Kempe. Rept. no. 13 (Final) for 7 June 55-31 July 57 on Contract DA 19-129-qm-388. [1957] 85p. 11 refs.
Order from LC mi$4.80, ph$13.80 PB 136 727

Data are presented to show that the F_0 required to sterilize inoculated packs of either raw or precooked ground beef can be considerably reduced by preirradiation with gamma rays from cobalt-60. Ground beef packed in No. 1 picnic tin cans was sterilized by combined irradiation-heat treatments, as well as by heat and by irradiation processing alone. It will be noted that a combined process, sufficient to sterilize precooked ground beef containing 300 PA 3679 spores per can, is much more than adequate to sterilize similar meat containing 5,000,000 C. botulinum 213B spores per can. This provides a large margin of safety against possible botulinus poisoning from underprocessed meat if the process is originally designed to kill PA 3679 spores. The data adequately demonstrate little if any difference between cooked and raw meat with respect to the severity of irradiation-heat processing treatments required to produce sterile products.

Packaging

Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT OF FOAMED-IN-PLACE PLASTIC ENERGY ABSORBING MATERIALS. Final rept.

31 Dec 56-31 Mar 58 on Aerial Delivery Equipment, Contract DA 19-129-qm-838. [1958] [80]p. 25 refs.
Order from OTS $2.00 PB 151 436

This program of research dealt with investigations of materials, methods, and equipment which would be suitable for the production of foamed-in-place, plastic, energy-dissipating structures in the field for later assembly with aerial drop containers. Polyurethane systems were selected for the initial investigations. Another phase of the program was concerned with investigations on the thermal balance of highly exothermic foamed-in-place plastic systems, which might have application as energy absorbers and as flexible and rigid insulating materials. Exploratory trials to determine feasibility of foaming-in-place with some of these resin systems at arctic temperatures, i.e. -40°F to -65°F, were to be carried-out. It was also necessary to devise, construct, and install an inexpensive but reliable instrument for measuring and comparing the energy-dissipating properties of the experimental foams. A process was developed for the production of highly exothermic "one-shot", resin systems which could be foamed-in-place under their own heat of reaction to cured, rigid foams with equivalent or better energy-dissipating properties than foamed glass at comparable densities. A simple laboratory drop tester was constructed and used.

Joint Military Packaging Course, Rossford Ordnance Depot, Toledo, Ohio.
JOINT MILITARY PACKAGING. PHASE II. PACKING AND CARLOADING. 9-L-F3(II). July 58, 357p. 152 refs.
Order from OTS $5.00 PB 151 325

Contents:
Introduction to packing and carloading
General departmental packing policies
Nailed wood boxes
Fiberboard boxes
Cleated panel boxes
Wirebound wood boxes
Waterproof barrier materials
Crates
  Introduction
  Materials, components and assembly
  Specification requirements (MIL-C-104)
  Specification requirements (MIL-C-132)
  Miscellaneous
Special purpose containers
Blocking, bracing and cushioning
Marking
Packing inspection
Freight regulations
Preparation of freight for air shipment
Economy in packing
Carloading
  Closed cars and trucks
  Open cars

Quartermaster Research and Engineering Center, Natick, Mass.
COCOONING STORAGE, by Joseph P. Urbanek and William F. Hamrock. Sep 58, 35p. Technical rept. CP-9
Order from OTS $1.00 PB 151 647

Fifty-nine experimental cocooned enclosures were erected at the Richmond Quartermaster Depot and weather exposure observations made over a period of some four years. The enclosures were experimental adaptations of the "cocooning" or "mothballing" principle as it might be applied to storage of Quartermaster items. Included are detailed descriptions and drawings of the two enclosures which performed best during the test. The materials and constructions which had been found ineffective are also discussed.

Rock Island Arsenal Lab., Ill.
FUNGUS-PROOF BARRIER MATERIALS, by Evelyn S. Burke. Rept. no. 3, 19 Feb 59, 22p. 52 refs. Rept. no. 59-493; AD-210 923.
Order from LC mi$2.70, ph$4.80 PB 140 668

Wax and scrim components of MIL-B-121A, Grade C barrier materials were treated with various percentages of copper-8-quinolinolate and fabricated into Grade C type barriers. Addition of 0.2% copper-8-quinolinolate in the wax or scrim component was sufficient to render the barrier mold resistant when subjected to 28 days inoculation after inoculation with pure cultures of Chaetomium globosum, Aspergillus terreus and Aspergillus niger, respectively, on sugar free media. Recommendations are made for requirements and test methods pertaining to fungus resistance and corrosiveness of MIL-B-121A, Grade C materials.

Rock Island Arsenal Lab., Ill.
SIX-YEAR STORAGE PROGRAM TESTS-PACKAGED ITEMS, by R. L. Murrens. 10 Feb 59, 182p. Rept. no. 59-363.
Order from LC mi$8.40, ph$28.80 PB 140 381

This report covers results observed on packaged items examined after eight years of shed and unheated warehouse storage at Rock Island Arsenal, Red River Arsenal and San Jacinto Ordnance Depot. It also includes results observed on packaged items after seven years of shed and unheated warehouse storage at the Naval Supply Depot, Bayonne, New Jersey.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

General Mills, Inc., Minneapolis, Minn.
FINE GRINDING STUDY, by C. D. Fitz, A. Gaalswyk and others. Final rept. for 1 Dec 54-31 Nov 55 on Contract DA 18-064-404-CML-9. 15 Dec 55, 247p. 24 refs. Rept. no. 1486.
Order from LC mi$11.10, ph$37.80 PB 140 443

Contents:
Mechanics of fine particle size reduction by impact milling
Mechanics of fine particle size reduction with fluid energy mills
Development and evaluation of classifiers
Particle size analyses and particle shape study
Biological studies

General Mills, Inc., Minneapolis, Minn.
FINE GRINDING STUDY, by J. H. Nash, R. K. Olson and J. S. Baumstark. Final rept. for 30 Nov 55-31 Dec 57 on Contract DA 18-064-404-cml-117. 28 Feb 58, 168p. 8 refs. Rept. no. 1830.
Order from LC mi$7.80, ph$25.80 PB 140 442

Theoretical and experimental investigation of factors affecting size reduction in two basic types of mills, namely, mechanical impact and fluid energy. To develop equipment to be incorporated into a complete system for the size reduction of biological materials to a product having a maximum percent according to mass in the 1 to 5 micron size range with a maximum viability recovery a complete integrated mill system consisting of a vibratory screw feeder, a Micronizer 404 fluid energy mill, a DC-II-B inertial classifier and a 2-1/2 inch cyclone collector was assembled.

Engines and Propulsion Systems

AeroChem Research Labs., Inc., Princeton, N. J.
ADVANCED PROPULSION SYSTEMS: A PRELIMINARY STUDY, by H. F. Calcote. Technical pub. no. 6 on Contract Nonr-2336(00). July 58, 102p. 31 refs. Technical pub. no. 6.
Order from OTS $2.50 PB 151 796

A critical study was made of some advanced propulsion systems with particular attention to the propulsion motor and the power source as separate units. The primary objectives were to evaluate the state of the art and estimate fruitful lines for future research. The general principles of propulsion as they pertain to non-conventional systems was reviewed. Magnetogasdynamic propulsion deserves more attention. The most important parameter in power plants for low thrust motors is the specific mass (power plant mass per unit power.) Of the β-batteries, nuclear electronvoltaic power plants employing semiconductors are the most attractive. Several solar energy conversion techniques are promising, including simple thermoboilers. Recent developments in semiconductors make the thermoelectric effect and the photovoltaic effect promising.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ION ROCKET ENGINE DESIGN, by Richard Cortis Wingerson. Master's thesis. Feb 59, 96p. 16 refs. GNE-59-20.
Order from OTS $2.25 PB 151 794

A design is developed for a test engine of the type considered most feasible at present, an electrostatic accelerator of gaseous propellent particles ionized by contact with a suitable surface. Simple engine modifications will permit testing of many propellents and surfaces. Derivations are included of most of the important relationships concerning ion propulsion.

James Forrestal Research Center, Princeton, N. J.
EXPERIMENTAL VERIFICATION OF NOZZLE ADMITTANCE THEORY IN A SIMULATED ROCKET CHAMBER, by Sotirios Lambiris. Technical rept. PR-74-R on Project Squid, Contract Nonr-1858(25). Nov 57, 81p. 6 refs.
Order from LC mi$4.80, ph$13.80 PB 136 751

The boundary condition represented by the supercritical exhaust nozzle of a simulated combustion chamber in the presence of pressure oscillations has been investigated in the light of theoretical analyses by Tsien and Crocco. The primary purpose of the present study was to establish experimentally the validity of the nozzle admittance theory. The theoretical dynamic pressure-amplitude response of a simulated rocket chamber using air was calculated as a function of nondimensional frequency in terms of several experimental configurations, using as one of the boundary conditions the theoretical values for nozzle admittance. The actual pressure-amplitude response was then determined experimentally, using a variable-frequency siren-type flow modulator to provide a near-sinusoidal pressure disturbance at one of several axial locations. Four different subsonic choked nozzle designs (sharp orifice, beveled orifice, linear velocity gradient, and conical) were examined for chamber Mach numbers from 0 to 0.2 at a constant chamber pressure of approximately 420 psi, using 3 different axial locations of the forcing disturbance.

Material Lab., New York Naval Shipyard, Brooklyn.
QUALIFICATION INSPECTION OF N160, SIZE 0 AC CONTACTOR MANUFACTURED BY WARD LEONARD ELECTRIC CO., MOUNT VERNON, N. Y. Final rept. 28 Jan 59, 5p. 3 refs. Lab. project 5274-D-10.
Order from LC mi$1.80, ph$1.80 PB 140 489

Material Lab., New York Naval Shipyard, Brooklyn.
QUALIFICATION TEST OF N162, SIZE 2, 50 AMPERE 450 VOLT A. C. CONTACTOR, MANUFACTURED BY THE WARD LEONARD ELECTRIC CO., MOUNT VERNON, N. Y. Final rept. 23 July 58, 7p. Lab. project 5274-D-8.
Order from LC mi$1.80, ph$1.80 PB 140 488

Material Lab., New York Naval Shipyard, Brooklyn.
REPORT OF EVALUATION OF A CHECK VALVE INTENDED FOR USE WITH MANOMETER TYPE INDICATORS. Final rept. 29 July 58, 17p. 3 refs. Lab. project 5138-19.
Order from LC mi$2.40, ph$3.30 PB 140 487

Ordnance Fuels and Lubricants Research Lab., Southwest Research Inst., San Antonio, Tex.
CORRELATION OF THE FACTORS WHICH AFFECT VAPOR LOCK, by B. C. Dial. Rept. on Contract DA 23-072-ORD-1011. July 58, 61p. 101 refs.
Order from OTS $1.75 PB 151 437

Factors which affect vapor lock in military and civilian vehicles are reviewed in the light of developments since 1954. Conflicting views were revealed by the automotive and petroleum industry as to the magnitude of the vapor lock problem, and on a suitable method of expressing fuel volatility as related to vapor locking tendencies. The review indicates an urgent need by the military for a uniform, more accurate

method of volatility measurement. Further improvement in fuel system designs may be achieved through application of basic heat transfer principles to reduce operating temperatures of fuel plumbing and pumps.

Plasmadyne Corp., Santa Ana, Calif.
FUNDAMENTAL INVESTIGATION OF ELECTRICAL POWER SOURCES FOR ELECTRICAL THRUST DEVICES; BIBLIOGRAPHY, by Helen Fife. Rept. on Contract AF 49(638)332. 3 Sep 58, 38p. 379 refs. Technical Note E-2TN098-332; AFOSR TN-58-791; AD-202 224.
Order from OTS $1.25 PB 151 430

The work of this contract is to make a feasibility study of electric power sources for electric thrust devices. Inasmuch as electric thrust devices will be used on space vehicles, space missions determine the environment in which the power sources must operate. This new environment opens up possibilities that would be outside the realm of practicability for vehicles operating within the earth's atmosphere. For this reason, it was considered desirable to take a fresh new look at the electric power sources that have been proposed from time to time. The present bibliography is a partial result of this approach.

Sanderson and Porter, New York.
CLOSED CYCLE GAS-TURBINE TEST FACILITY. Design rept. on Contract DA 44-009-eng-2562. Feb 57, 251p. 12 refs.
Order from LC mi$11.10, ph$39.60 PB 140 625

The test facility is designed for calibration, test and development of components of a compact, lightweight closed cycle gas turbine plant, the conceptual design of which was completed under the original Contract No. DA-44-009-ENG-2562, and reported in Reference (1). This "ultimate" plant is to provide 400 kw of 60 cycle 3 phase electric power, with a thermal efficiency of at least 16 per cent (based on the heat absorbed by the working fluid), air-cooled, using high purity nitrogen as the working fluid. Components used in the test facility are to be those designed for the ultimate plant wherever possible, so that their performance, durability and suitability may be evaluated and a control system worked out. The test facility is to be erected and installed in an extension to the Engine Test Laboratory, Building 324, at the Engineer Research and Development Laboratories, at Fort Belvoir.

Sundstrand Machine Tool Co., Pacoima, Calif.
SPRAY INFORMATION AND BREAKUP, AND SPRAY COMBUSTION, by A. E. Fuhs. Technical note no. 4, Contract AF 18(603)107. 5 Feb 58, 132p. 107 refs. AMF/TD-1199; AFOSR TN-58-414; AD-158 217.
Order from OTS $2.75 PB 151 645

This report is a survey of the literature in the field of liquid spray behavior. Part I is a discussion of the known means for atomizing liquids and the mechanisms for jet and sheet breakup under the various environments of non-burning media. The subsequent distributions and behavior of liquid drops in sprays are then examined. Application to rocket motors of sprays formed by impinging jets is considered in some detail. Part II deals with those aspects of sprays associated with the combustion process.

Manufacturing Equipment and Processes

Army Ordnance Corps, Washington, D. C.
PROCEEDINGS OF INDUSTRIAL TECHNOLOGY CONFERENCE ON METALS PROCESSING 16-18 OCTOBER 1957 HELD AT WATERTOWN ARSENAL, WATERTOWN, MASS., General Thomas J. Rodman Laboratory. 392p.
Order from OTS $5.00 PB 151 308

Contents:
Production of high quality cast steels by basic electric arc melting, by J. Zotos
Vertical centrifugal tube casting development, by A. Krystofik
Simplification of component manufacturing through precision casting and other methods, by E. R. Mackiewicz
Resinless shell molding, by G. I. Gartner
High-strength aluminum castings, by G. D. Chandley
Application of investment castings to the manufacture of small arms components and related manufacturing problems, by J. F. Panda
Sintered alumina molds for investment castings, by F. C. Quigley
Precoats for investment casting, by G. Pributsky and W. M. Kisner
Induction furnace melting to produce low-cost titanium, by P. J. Ahearn
Ultrasonics improve mechanical properties, by J. F. Wallace
Hot extrusion of gun tubes, by J. H. Penrose
Manufacturing improvement in the fabrication of 155MM shell (metal parts), by J. J. Obren
Manufacturing improvements in the fabrication of caliber .30, armor piercing cores, by D. Siefert
Rapid heating techniques, by A. M. Ayvazian
Report on rubber die crimping of aircraft gun ammunition, by E. Myers
Process engineering from prototype to production of the 8 inch M 106 HE shell by the hot cup-machine-cold extrude method, by H. J. Babcock
Designing for easier machining and accuracy, by J. Kreitmeyer
Chromium plating on aluminum, by M. S. Spivak and W. M. Kisner
Rotary extrusion of liners, by C. Zglenicki
Cold forging (swaging) process, by S. Valencia
Machinability testing and the use of the radiometric methods, by F. J. Daasch
Routine machinability testing aids production, by R. F. Mennell
Evaluation of physical and chemical properties of various carbide tool tips, by G. Underhill and F. J. Crowley
Trepanning, by G. Hutson
Diamond reclamation, by F. J. Crowley
Pull reaming, by D. Bisceglia
Status report on brittle cutting tool material, by W. B. Kennedy
Sensitivity of electrochemical potential to the degree of sintering, by B. Bovarnick
General operating accuracies in fluorescent X-ray

spectroscopy, by F. J. Crowley
Progress report on the development of a practical forgeability test, by H. M. Green
New continuity test for phosphate coatings, by W. M. Kisner
Reproducibility of impact tests, by D. E. Driscoll

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
FORECASTING REQUIREMENTS FROM THE BUSINESS STANDPOINT, by Charles C. Holt. ONR Research memo. no. 56 on Planning and Control of Industrial Operations, Contract Nonr-760(01). 11 Oct 57, 37p. 20 refs.
Order from LC mi$3.00, ph$6.30 PB 136 679

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
JOINT TRIGGER AND LOT SIZE DECISIONS FOR A SIMPLE WAREHOUSE SYSTEM, by Peter R. Winters. ONR Research memo. no. 55 on Planning and Control of Industrial Operations, Contract Nonr-760(01). 20 Sep.57, 36p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 136 680

This paper considers the decisions for the joint production of several items, where there is a common fixed cost of production, or the production of joint lots of one item to be sent to several warehouse locations. A multiple trigger rule has been developed to decide when to start production; the rule considers jointly the inventory positions and sales (usage) forecasts for each item, or each location where the single item is held. A lot size rule prescribes the amount to be produced, and how this amount should be divided among items or warehouses. Numerical examples of the trigger are given.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
JOINING OF BERYLLIUM, by N. E. Weare and R. E. Monroe. 30 Mar 59. 27p. 16 refs. DMIC Memo. 13.
Order from LC mi$2.70, ph$4.80 PB 140 521

Beryllium is a brittle metal and is difficult to fabricate and join. Limited success has been reported on direct welding by tungsten-arc, pressure, and electron-beam processes. Good joints have been made by braze welding with aluminum filler and brazing with silver and the silver-copper eutectic alloy.

General Mills, Inc., Minneapolis, Minn.
SURVEY OF TECHNICAL LITERATURE ON GRINDING AND SEPARATION, by E. N. Kemler, M. H. LaJoy and others. 15 May 53, 148p. 529 refs. Rept. no. 1191.
Order from LC mi$7.20, ph$22.80 PB 135 386

Hycon Eastern, Inc., Cambridge, Mass.
FUNDAMENTAL MODE FILTER CRYSTALS, by Peter D. Macdonald. Quarterly progress rept. no. 1, 21 Aug 57, on Development of Design Data for Fundamental Thickness Shear Filter Crystals, Contract DA 36-039-sc-73234. 21 Oct 57, 24p. 2 refs.
Order from LC mi$2.70, ph$4.80 PB 140 599

A new crystal research facility has been completed and production of experimental crystal units initiated. A spurious mode identification and mapping device has been designed and constructed. Tests of the device have been conducted and predicted performance confirmed. It is now possible to accomplish rapid identification and mapping of spurious modes. Theoretical investigations have led to the formulation of a descriptive theory of the nature of spurious modes. This theory will be used to guide further investigation.

Hycon Eastern, Inc., Cambridge, Mass.
FUNDAMENTAL MODE FILTER CRYSTALS, by Peter D. Macdonald. Quarterly progress rept. no. 2, 21 Aug-21 Nov 57, on Development of Design Data for Fundamental Thickness Shear Filter Crystals, Contract DA 36-039-sc-73234. [1957] 57p.
Order from LC mi$3.60, ph$9.30 PB 140 600

Development of the spurious mode identification and mapping device has been completed. Using this device, data has been taken on a large percentage of the 90 experimental crystals produced during the reporting period. Representative data on 10 Mc/x AT crystals with both circular and triangular shapes and various electrode sizes is presented. Conclusions drawn from the data are presented including some ideas on the behavior of the triangular AT plate. Supposedly identical crystals have individual characteristics to an unexpected degree. The triangular crystal is more free from spurious modes than an equivalent circular plate and for both types of crystals a decrease in electrode size decreases the drive to the spurious modes. (See also PB 140 599)

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF THE COMPARATIVE PERFORMANCE OF "O" RING AND RECTANGULAR RING DESIGN UNIONS INTENDED FOR HIGH PRESSURE SERVICE. Final rept. 2 Feb 59, 21p. 6 refs. Lab. project 6024.
Order from LC mi$2.70, ph$4.80 PB 140 483

Results are reported of an investigation of the comparative performance of "O" ring and rectangular ring design unions intended for use in the pressure range of 3000-5000 psi. The "O" ring design unions were found to be lighter in weight and smaller in overall size than the corresponding size rectangular ring design unions and were found to be approximately equal in performance to the rectangular ring unions with respect to pressure tightness under conditions of severe vibration, high flexural loads, and high internal hydrostatic pressures.

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF THE COMPARATIVE PERFORMANCE OF TYPE A AND TYPE B BRONZE SILVER BRAZING UNIONS. Final rept. 29 Jan 59, 12p. 7 refs. Lab. project 6041.
Order from LC mi$2.40, ph$3.30 PB 140 482

Michigan U. Research Inst., Ann Arbor.
MOVING LOADS ON FLOATING ICE SHEETS, by James T. Wilson. Final rept. on Contract AF 19(604)1558. July 58, 25p. 8 refs. 2432-3-F; AFCRC TR-58-243; AD 152 589.
Order from LC mi$2.70, ph$4.80 PB 136 889

A simple theory of the coupling between a moving load and the flexural waves generated by it in a floating ice sheet is developed. A number of experiments to verify this theory are reported. These experiments include measurements of the waves resulting from constant-velocity loads and the waves resulting from aircraft landings and take-offs. The experimental data indicate that amplitudes at least three times as great as the "static" deflection can result when a vehicle travels at a velocity corresponding to the minimum wave velocity of flexural waves in the ice.

Midwest Research Inst., Kansas City, Mo.
THE STRESS DISTRIBUTION IN ADHESIVE JOINTS, by James L. Lubkin. Final rept. on Contract NOrd-13383. 15 Aug 54 [136]p. AD-156 143.
Order from LC mi$6.90, ph$22.80 PB 140 393

Rodman Lab., Watertown Arsenal, Mass.
SIGNIFICANCE OF REDUCED PHOSPHORUS AND SULFUR CONTENT ON THE DUCTILITY AND TOUGHNESS OF CAST LOW ALLOY STEELS, by John Zotos. Rept. on Industrial Preparedness Measure. Dec 58. 21p. 19 refs. Rept. no. RPL 10/14.
Order from LC mi$2.70, $4.80 PB 140 497

A developed basic-electric arc furnace melting practice was employed to produce low sulphur and low phosphorus 1040, 4140, high nickel 4325, 4330 and high silicon 4340 type steel castings. The castings produced were chemically analyzed and the high nickel 4325 and 4330 cast steels were subjected to various heat treatments and physically tested. A decrease in the sulphur content of the high nickel 4325 steel castings resulted in a significant increase in the reduction in area, impact strength and elongation, while maintaining a constant strength level. A decrease in both the phosphorus and sulphur content of several 4325 and 4330 castings also resulted in a significant improvement in their ductility and impact resistance.

Rodman Lab., Watertown Arsenal, Mass.
SINTERED ALUMINA MOLDS FOR INVESTMENT CASTING OF STEELS, by Francis C. Quigley and Bennett Bovarnick. Rept. on Industrial Preparedness Measure. Dec 57 [16]p. 5 refs. Interim Technical rept. no. RPL 13/6.
Order from OTS $0.50 PB 151 435

Exploratory investigations were conducted to study the requirements and techniques of a molding process that would result in thin walled precision investment molds. Mold characteristic requirements led to selection of aluminum oxide as a possible base material. These molds were formed by dipping a pattern into an alumina slip and coating with grit to build the desired wall thickness. The green molds were dewaxed and fixed at 2200°F for 25 minutes. Castings of 1020, 1030, and 4340 alloy steels were produced for evaluation purposes. The basic techniques were developed for fabrication of a thin walled mold with high refractoriness suitable for precision casting of low alloy steels. Castings produced had good (1) surface finish, (2) metal quality and (3) dimensional reproducibility. Short time moderate temperature firing cycles have been found to develop adequate strength in the finished mold. The process appears to be economically competitive with existing precision casting methods.

Rodman Lab., Watertown Arsenal, Mass.
SODIUM-SILICATE BONDED SHELL MOLDS, by Paul J. Ahearn and Gideon Gartner. Rept. on Production Engineering Measure. Mar 58 [17]p. 5 refs. Rept. no. RPL 13/5.
Order from OTS $0.50 PB 151 434

A satisfactory technique was developed for manufacturing silicate bonded shell molds. Sound steel and aluminum castings were produced from these molds. Material cost per mold is substantially lower than for conventional shell molds, while manufacturing times for the two processes are comparable. Steel cast in silicate bonded molds is free from the pitted surface often associated with conventional shell molding.

Standard Pressed Steel Co., Jenkintown, Pa.
TENSION-TENSION FATIGUE INVESTIGATION OF HIGH STRENGTH AIRCRAFT BOLTS EFFECT OF NUT ENGAGEMENT AND THREAD ROOT RADIUS, by Thomas C. Baumgartner, Edward F. Gowen, Jr. and Corey Crispell. Rept. for 2 Apr 56-15 Feb 58 on Contract AF 33(616)3646. Feb 58, 228p. WADC Technical rept. 58-326; AD-155 865.
Order from LC mi$9.90, ph$34.80 PB 140 394

Tension-tension fatigue properties of external threads without the influence of stress concentrations resulting from engagement; and fatigue characteristics of bolts to those of unengaged threads. On parts heat treated to two strength levels, 160,000 psi and 220,000 psi. These were made from the following materials: AISI 8740, AISI 6150, AISI 4340, Hy Tuf and VascoJet 1000. All bolts were cadmium plated. The studs were tested with and without plating.

Stanford U., Calif.
DECENTRALIZATION AND COMPUTATION IN RESOURCE ALLOCATION, by Kenneth J. Arrow and Leonid Hurwicz. Technical rept. no. 56 on Contract N6onr-251(33). 5 June 58, 101p. 47 refs.
Order from LC mi$5.70, ph$16.80 PB 140 347

The bearing of some recent developments in mathematical economics on the problem of the optimal allocation of resources is discussed. Attention is confined to an economy whose aims are well defined. For a given technology, the possibilities of different output combinations are restricted by the availabilities of primary resources. The problem of optimal resource allocation is to choose among all the feasible combinations of production processes that combination which maximizes the utility achieved by the economy.

Syracuse U. Research Inst., N. Y.
THE DEVELOPMENT OF A PRACTICAL FORGE-

ABILITY TEST: SURVEY OF FORGEABILITY TESTS, by A. B. Draper and G. Sachs. Interim technical rept. no. 1 on Contract DAI-30-115-505-ORD-(P)-668. Mar 56, 31p. 72 refs. Rept. no. MET369-563T1.
Order from LC mi$3.00, ph$6.30 PB 140 330

The present comprehensive survey of the literature evaluates the relative worth of the known forgeability tests. "Forgeability" is presented as a composite of three quantities (1) flow stress or internal friction, (2) ductility, and (3) the friction coefficient. The report covers the use of the compression test to determine each of the three components of forgeability, also tension, bend, torsion and special forgeability tests.

Transport, Traction and Hoist Facilities

Army Transportation Research and Engineering Command, Fort Eustis, Va.
DEEP SNOW MOBILITY TESTS, HOUGHTON, MICHIGAN, FY 58. PART II: ARTICULATED DYNAMOMETER VEHICLE (POLECAT), by Carlo J. Roma and Robert McGowan. Oct 58, 17p. Final rept. on Proj. 9-98-09-000, Test C-5; AD-203 084.
Order from LC mi$2.40, ph$3.30 PB 140 561

Essentially, the Polecat is made up of two Weasel chassis connected by an articulated joint. It is powered by a single engine, and the articulated joint transmits both driving and steering forces between the two sections. Comparative snow performance tests were conducted between the standard M29C Weasel and the Polecat to evaluate the articulated vehicle concept. The tests indicated that in addition to an increase in drawbar pull coefficient, the articulated concept provides reduced pitching, full traction under steering, and steering control at all times. Tests also indicate that the track life of the articulated vehicle may be increased.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
RAILWAY CARS, AMBULANCE TRAIN, 56-1/2, 60-63-, and 66-INCH GAGE, FOREIGN SERVICE, by Emil G. Ringberg and William R. Snelling. Nov 58, 46p. Final rept. on Proj. 9-56-02-000, Task 101R; AD-148 493.
Order from LC mi$3.30, ph$7.80 PB 140 564

The report covers the development and engineering testing of the railway cars of the broad-gage ambulance train. Three types of cars were developed: a ward car, a personnel car, and a kitchen-dining-storage car. Engineering testing of these prototypes was performed by a Transportation Corps rail unit at Fort Eustis, Virginia. The ambulance cars will be type-classified as standard Transportation Corps equipment to support the mission of The Surgeon General.

Bureau of Mines, Pittsburgh, Pa.
DISPERSION OF FINE POWDERS FROM SMALL RESERVOIRS, by Murray Weintraub and James W. Myers. Final rept. for 1 Mar 52-30 Oct 55 on Flow Properties of Fine Particles, Part 2. [1955] 99p. 5 refs.
Order from LC mi$5.40, ph$15.30 PB 140 283

An investigation has been conducted into the factors governing the dispersion of powders smaller than 10 microns in diameter from a packed state in a small reservoir into a transport tube. The system studied consisted of a reservoir in the shape of a cylinder 5 to 10 inches long and 0.75 to 1.50-inch in diameter. Outlet tubes varied from 4 to 14 inches in length and from 1/16- to 3/16-inch inside diameter. The "free-falling terminal velocity" of the particle agglomerate was disclosed to be a critical parameter of the reservoir design. For rates below this terminal velocity the quantity of powder that remains in the reservoir can be correlated with the gas velocity and reservoir dimensions by means of a simple fluidization theory. The influence of outlet tube dimensions upon gas quantity and pressure requirements and upon rate of solids flow was determined. The discharge of a powder designated as "Sm" was studied. The discharge could occur either as a fluidized flow or as a piston type of flow, depending upon the gas rate. From fluidization measurements it was estimated that the "Sm" consisted of agglomerates averaging 760 microns in diameter and a density of .49 grams per ml.

Bureau of Mines, Pittsburgh, Pa.
FLOW IN PNEUMATIC TRANSPORT SYSTEMS, by Murray Weintraub and James W. Myers. Final rept. for 1 Mar 52-30 Oct 55 on Flow Properties of Fine Particles, Part 1. [1955] 159p. 25 refs.
Order from LC mi$7.50, ph$24.30 PB 140 284

An investigation has been conducted into the factors governing the flow of fine particles. The program has surveyed a broad field, and the experimental work has been extensive rather than intensive. Observations on the dense-phase flow of sand through horizontal and vertical tubes are reported and discussed. Horizontal aerated flow was investigated for 57-micron and 33-micron glass spheres, and for 1-micron magnesium silicate. The effects of air rate, solids rate, tube diameter, and tube length were studied, and tentative correlations are proposed.

Bureau of Yards and Docks, Washington, D. C.
ADMINISTRATION AND OPERATION OF TRANSPORTATION EQUIPMENT (AUTOMOTIVE, CONSTRUCTION AND RAILROAD EQUIPMENT). 31 July 57, 370p. Technical pub. NAVDOCKS TP-Tr-1, rev.; BUDOCKS INST 11200.2A and 11200.2A CH 1.
Order from LC mi$11.10, ph$56.10 PB 140 332

Presented herein are the procedures that apply to the procurement, assignment, requirements, allowances, registration, technical record control, disposition, operation, and use of specific types of automotive vehicles, construction equipment, and railroad equipment.

Bureau of Yards and Docks, Washington, D. C.
MAINTENANCE MANGEMENT OF TRANSPORTATION EQUIPMENT; AUTOMOTIVE VEHICLES; CONSTRUCTION, WEIGHT-HANDLING, AND RAILROAD EQUIPMENT. Sep 58, 153p. Technical pub. NAVDOCKS TP-TR-2, Rev.; BUDOCKSINST 11240.36B.
Order from LC mi$7.50, ph$24.30 PB 140 338

This publication has been prepared as a technical aid for all personnel concerned with the maintenance and repair of automotive, construction, weight-handling, and railroad equipment owned or operated by the Navy. Specific information presented herein outlines basic policies and establishes a uniform system for automotive and equipment maintenance, shop management, and related techniques. Also presented are the standards, methods, guides, and technical instructions that form the basis of the Navy's maintenance and repair program as applied to automotive, construction, weight-handling, and railroad equipment.

Bureau of Yards and Docks, Washington, D. C.
WEIGHT-HANDLING EQUIPMENT. 15 Oct 55, 250p. 21 refs. Technical pub. NAVDOCKS TP-Tr-24; BUDOCKSINST 11262.2 and Changes 1-2.
Order from OTS $3.50 PB 151 757

This publication has been prepared as a technical guide for civilian and military personnel of the Navy concerned with the selection, design, procurement, fabrication, erection, and acceptance testing of weight-handling equipment. Presented herein are the criteria and procedures followed by this Bureau in its design and construction of weight-handling equipment, particularly the various types of cranes, derricks, and hoists. Not considered herein are the operation, maintenance, repair, alteration, and preservation of weight-handling equipment, nor are the following types described: warehouse lifting and transferring equipment, forklifts, dollies, straddle carriers, conveyors, elevators, tractors, wagons, shovel and hoe attachments, cableways, capstans, windlasses, marine railway hoists, wrecking cranes, piledrivers, and movable bridges. However, criteria and procedures presented herein may be applicable to many of these types of equipment.

MATERIALS

Bureau of Yards and Docks, Washington, D. C.
QUALITY CONTROL PROCEDURES FOR SURVEILLANCE AND INSPECTION. Nov 57, 49p. Technical pub. NAVDOCKS TP-QC-1; BUDOCKSINST 4080.3.
Order from LC mi$3.30, ph$7.80 PB 139 133

This publication establishes the procedures to be followed by activities under the management control of the Bureau of Yards and Docks for the surveillance and inspection of materiel stocks under the technical control of this Bureau. Part A contains the purpose and scope of the publication, pertinent definitions and a summary of this Bureau's authority and general responsibility for the Quality Control Program, specifically in regard to surveillance and inspection of materiel. Part B defines the standards of quality, particularly the classification of defects, and the evaluation and inspection of end items and components. Part C covers the definitions and procedures connected with the operation of the program, including the formation of lots, and procedures for inspection of materiel receipts, materiel in storage, and materiel prior to shipment, including inspection by sampling. Part D outlines the extent of corrective action to be taken on the basis of inspection results. Part E defines and describes the operational tests, also their applicability and frequency, and establishes the sampling plan to be used to determine the acceptance or rejection for operational defectives. Part F explains the basis and use of the Master Sampling Table. Part G describes reports to be made.

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT ON ADHESIVES FOR GLASS REINFORCED POLYESTER LAMINATES, by S. E. Yustein. Final rept. 22 Aug 58, 10p. Lab. project 5616-1.
Order from LC mi$1.80, ph$1.80 PB 140 506

The objectives of the program were three fold: to develop a specification for the procurement of adhesives for glass reinforced plastics; to prepare an instruction manual on adhesives for glass reinforced plastics; and to prepare a design manual on adhesive bonded glass reinforced plastic joints.

Owens-Corning Fiberglas Corp., Newark, Ohio.
PROPERTIES OF GLASS FIBERS AT ELEVATED TEMPERATURES, by W. H. Otto. Quarterly rept. no. 3, 16 Dec 58-15 Mar 59, on Contract NOas-58-841-c. 31 Mar 59, 12p.
Order from LC mi$2.40, ph$3.30 PB 140 701

Static fatigue measurements in dry air at temperatures up to 1300°F and load durations up to 20 hours were made on E-glass and on the Fiberglas X-37B composition. Tensile strength measurements were made at temperatures up to 2000°F on silica fibers.

Ceramics and Refractories

Air Force Cambridge Research Center, Bedford, Mass.
NEUTRON ACTIVATION ANALYSIS OF TRACE IMPURITIES IN SILICON CARBIDE, by L. F. Lowe, H. D. Thompson, and J. P. Cali. Dec 58, 19p. 8 refs. AFCRC-TN-58-595; AD-208 044.
Order from LC mi$2.40, ph$3.30 PB 140 641

A method is described for the analysis of nickel, manganese, copper, zinc, antimony, molybdenum, and iron in silicon carbide. The inherent sensitivity of the method ranges from 0.01 ppm for iron to less than 0.001 ppm for manganese. The impurities in the silicon carbide are activated by neutrons in a nuclear reactor. The activated impurities are removed from the silicon

carbide, by decomposition of the matrix. Decomposition takes place when chlorine gas is passed over the silicon carbide at 1300°C. The impurities are caught in a trap and separated by the radiochemical procedures described herein. Results obtained by this method are compared to those obtained by spectrographic techniques.

Armour Research Foundation, Chicago, Ill.
INVESTIGATION OF FLAKE LAMINATE, by S. W. Bradstreet. Final rept. for 1 Sep 54-26 Oct 56 on Contract DAI 28-017-501-ORD(P)-1491. 28p. 5 refs.
Order from OTS $0.75 PB 151 531

Extremely high tensile strength, heretofore observed only in cylindrical filaments of glass and metal, can be obtained with glass flakes or ribbons. Flaw-free pyrex ribbons, four microns in thickness, resisted tensile stresses exceeding one million p.s.i. The strength of glass ribbons and flakes is an inverse function of thickness. Failure of flake glass laminates occurs predominantly in the resin bond, and development of high-tensile, low-shrinkage resins is indicated for improving tensile and flexural properties.

Bausch and Lomb Optical Co., Rochester, N. Y.
RADIOPHOTOLUMINESCENT GLASS PRODUCTION TECHNIQUES, by N. J. Kreidl. Final development rept. on Contract NObsr-57010. [1954] 48p.
AD-50 451.
Order from LC mi$3.30, ph$7.80 PB 140 716

Techniques and equipment were developed for producing radiophotoluminescent glass at the rate of 5000 pieces of specified dimensions per day. This glass serves as the sensitive element in a radiation detector and must be capable of indicating an accumulative dosage of x and γ radiation over the 0 to 600 range.

Bettinger Corp., Waltham, Mass.
INVESTIGATION DIRECTED TOWARD THE DEVELOPMENT OF CERAMIC COATINGS WITH HIGH REFLECTIVITIES AND EMISSIVITIES FOR USE IN AIRCRAFT POWER PLANTS, by Edward A. Douglas. Rept. on Ceramic Coatings, Contract AF 33(616)2376. Feb 56, 114p. 25 refs. WADC Technical rept. 56-110; AD-116 235.
Order from OTS $2.50 PB 151 791

Dark materials are high emitters, and white materials are low emitters. Emissivity values for dark materials varied from 0.86 to 0.98, and for white materials values were 0.22 to 0.69 with treopax, feldspar, and zirconium spinel having the lowest values. To develop a good ceramic coating for low alloy steels, aluminous and silicious mill added refractories should be used with high melting glasses. To then develop coatings possessing desirable radiation characteristics is a problem of choosing the proper composition of glass and refractories.

Boeing Airplane Co., Wichita, Kans.
DEVELOPMENT AND EVALUATION OF ROCKET BLAST AND RAIN EROSION RESISTANT COMPOSITE COATINGS PRODUCED BY FLAME SPRAY TECHNIQUES, by J. R. Galli, G. I. Wheeler and others. Rept. for 1 July 57-1 Aug 58, on Finishes and Materials Presentation, Contract AF 33(616)5284. Feb 59, 246p. 516 refs. WADC Technical rept. 58-493; AD-209 913.
Order from OTS $3.50 PB 151 782

It was the purpose of this contract to determine the feasibility of utilizing multilayer coatings to protect metal surfaces from erosive and corrosive effects of rocket blast impingement. These coatings were to be comprised of two or more from the group: metal, ceramic, organic primer, and organic impregnant, with the metal and ceramic layers being applied by flame spray techniques. In the course of this study six ceramics, four powder spray metals, two wire spray metals, four substrate metals, and approximately sixty organic materials were combined into a large number of different coating systems. These coatings were subjected to a wide variety of tests culminating with actual exposure to rocket blast. A total of twenty-six different coating systems were obtained which successfully withstood four rocket blasts without significant deterioration, verifying the feasibility of this technique. The successful coatings were all of the spray material-impregnant type with the most resistant spray materials being the ceramics.

Carborundum Co., Niagara Falls, N. Y.
BORON NITRIDE AND REFRACTORY BODIES CONTAINING BORON NITRIDE, by K. M. Taylor and K. C. Nicholson. Final rept. for 22 June 50-21 June 51 on Contract NOrd-10982. 20 Aug 51, declassified 30 Sep 58, 53p.
Order from LC mi$3.60, ph$9.30 PB 140 687

Three methods of making boron nitride were experimentally investigated and the properties of the product obtained by one of these studied. A variety of refractory bodies containing boron nitride as the major or minor constituent was developed and a preliminary study made of the physical properties of some of these. Small experimental rocket nozzles, representing four of the most promising bodies, were produced for firing tests.

Minerals Research Lab., U. of California, Berkeley.
THE EFFECT OF IMPURITIES AND HEAT TREATMENT ON THE DUCTILITY OF MgO, by A. E. Gorum, W. Luhman, and J. A. Pask. Technical rept. no. 2 on Contract AF 49(638)56. Dec 58, 20p. 5 refs. Series no. 109, issue no. 2; AFOSR TN-58-1061; AD-207 221.
Order from LC mi$2.40, ph$3.30 PB 139 487

Very small amounts of impurity can greatly affect the strength and ductility of magnesium oxide. It appears that the impurity may move to and from the dislocations, moving away during heating and collecting again during cooling if the rate is slow enough. The dislocations are effectively pinned and the more dislocations present in the structure, the greater the effect on the strength and ductility.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON SILICON CARBIDE, by Edward Spitzer. 13 Feb 48, declassified 9 Mar 48. 38p. 49 refs.

NEPA-408-EMR-22; AD-204 916.
Order from LC mi$3.00, ph$6.30 PB 138 945

Silicon carbide is a synthetic crystalline mineral manufactured extensively for use as an abrasive. One of the most characteristic and desirable physical properties of SIC from the refractory point of view is its high emissivity. It is one of the hardest substances known and is very refractory as it does not decompose until 4000°F. is reached. The data presented are a compilation of previously published material from widely scattered sources, presented as far as possible in the form of graphs and tables.

Fuels, Lubricants, and Hydraulic Fluids

Aberdeen Proving Ground, Md.
PRESERVATIVES FOR STORAGE AND BRAKE COMPONENTS TEST OF HYDRAULIC FLUIDS FOR RECOIL AND HYDRAULIC MECHANISMS, HYDRAULIC BRAKES, POWER TRANSMITTING FLUIDS, by C. B. Jordan, C. F. Pickett, and R. P. Witt. Rept. no. 27 on Ordnance Proj. no. TB5-5010F. 29 Mar 54, 54p. Lab. Service Div. rept. no. 207.
Order from LC mi$3.60, ph$9.30 PB 140 427

The object was to investigate the preservative properties of oils reduced with various solvents, and determine their suitability as preservatives for hydraulic brake parts in warehouse storage and for brake parts of vehicles in stand-by storage.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
LUBRICATING OILS AND GREASES IN THE SOVIET UNION, by Nikita Cheremeteff. Literature research study. 22 May 58 109 p. 40 refs.
Rept. 1525-TR; AD-201 738.
Order from OTS $2.50 PB 151 294

This report is a comprehensive study of Soviet literature on lubricating oils. The report is divided into three chapters: I. Lubricants; II. Silicons and Oil Additives; and III. Greases. The text is supplemented by tables which give the characteristics of the different types of lubricating stuffs. Emphasis has been placed on oil additives used to counteract wear, oxidation, mechanical deposits, unstability, poor viscosity, and results of temperature variations. The different kinds of additives are defined, and their characteristics and functions are given.

Burke Research Co., Warren, Mich.
RESEARCH ON VINYLIC FILLER LUBRICANTS AND GREASES, by U. F. Nager, P. Davis and others. Rept. no. 25 (final) for 1 June 56-30 June 58 on Contract Nonr-2146(00). 14 July 58, 43p. 19 refs.
Order from LC mi$3.30, ph$7.80 PB 140 478

The initial primary aim of this project was to develop new lubricating greases which would stand up under shear at temperatures up to 300°C. (preferably above 500°C.) to which they might be subjected under operating conditions. By amendment the scope of the contract was broadened to include (1) the preparation of new fluorinated liquid polymers (by telomerization and contact catalysis) and (2) the investigation of greases prepared therefrom by combining with cross-linked vinylic polymers of colloidal particle size. A further object of this study has been to develop new methods for preparing fluorocarbon dinitriles for use in ONR research work directed elsewhere toward producing fluorocarbon elastomers.

Chicago U., Ill.
HYDRIDES AND BOROHYDRIDES OF LIGHT WEIGHT ELEMENTS AND RELATED COMPOUNDS, by H. I. Schlesinger, T. Wartik and others. Progress rept. nos. 31-35, 1 July 48-30 Sep 49, and Final, 1 July 48-30 June 49, on Contract N6ori-20, T. O. 10. [1949] 106p. 7 refs. ATI-61 048.
Order from LC mi$5.70, ph$16.80 PB 140 844

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DEVELOPMENT OF ANTI-SEIZE COMPOUND FOR TANK APPLICATION, by Robert A. Erb. Final rept. for 1 Mar 57-30 Apr 58 on Contract DA 36-034-ORD-2434. [1958] 28p. Rept. F-A2040.
Order from LC mi$2.70, ph$4.80 PB 140 242

An anti-seize compound fulfilling the requirements set forth in the original contract has been developed. This composition not only has anti-seize properties, partly arising from the solid lubricating properties of the contained Teflon powder but, in addition, is a tough, corrosion-preventing, heavy-duty, protective coating. This material is applicable by dip, brush, spray or, with modification, by aerosol bomb, and is useful both for factory and field application. The complete formulation and testing program is discussed in detail in the body of this report.

General Tire and Rubber Co., Wabash, Ind.
25 GALLON FREE-DROP CONTAINER, by W. C. Frehse. Final rept on Contract DA 44-109-qm-1543. [1958] 103p.
Order from LC mi$5.70, ph$16.80 PB 136 850

The principal object of this contract was to develop the design for a 25-gallon free-drop container for use with hydrocarbon products (combat automotive gasoline) and to furnish the Government with prototype containers which would satisfactorily permit safe transportation of gasoline by aircraft to the point of air-drop and satisfactorily meet actual free-drop performance requirements.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
PERFORMANCE OF JP-4 AIRCRAFT FUEL SYSTEM: A COMPARISON OF ANALYTIC PREDICTIONS WITH EXPERIMENTAL RESULTS FOR TWO-PHASE FLOW, by Henderson C. Ward, Mario J. Goglia and others. Rept. on Fuel and Propellant Sub-Systems, Contract AF 33(616)2660. Mar 57, 125p. 3 refs. WADC Technical rept. 55-422, Pt. 3; AD-130 905.
Order from LC mi$6.30, ph$1980 PB 140 707

Results are presented of a planned series of experiments conducted for the purpose of determining the applicability of a suggested method of calculating the performance of a JP-4 aircraft fuel system under two-phase flow conditions below the boiling altitude of the fuel. Before a generalization of the conclusions of this report is made, additional performance data for various engine fuel-transfer systems should be analyzed. (See also PB 137 123)

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT ON THE PURIFICATION OF JET FUEL BY CENTRIFUGATION, by S. A. Cohen and G. H. Reifenberg. Final rept. 23 Sep 58, 18p. Lab. project 5319-34.
Order from LC mi$2.40, ph$3.30 PB 140 503

The effects of corrosion inhibitor, naphthenic acid, rust, and thermal stabilizing agents on both the water pick-up characteristics of JP-5 jet fuel and the efficiency of removal of entrained water and rust therefrom by laboratory scale centrifugation have been investigated.

Michigan U. Research Inst., Ann Arbor.
THERMAL CONDUCTIVITY OF LUBRICATING OILS AND HYDRAULIC FLUIDS, by D. W. McCready. Rept. for 1 Apr 56-30 June 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3543. Mar 59, 59p. 11 refs. WADC Technical rept. 58-405; AD-211 693.
Order from OTS $1.50 PB 151 780

An all-metal concentric cylinder type of thermal conductivity cell was designed, fabricated, and calibrated to measure the thermal conductivity of forty natural and synthetic base lubricating fluids. Thermal conductivity values in the temperature range of from 70 to 500°F are reported for fluids considered stable to the higher temperature. The maximum temperatures for other fluids were limited by their instabilities under test conditions. Since each fluid has individual characteristics, no correlation of conductivity values appears possible. Values are considered precise and for possible correlation can be compared to those of a fluid chosen as a "standard reference."

Naval Engineering Experiment Station, Annapolis, Md.
EFFECT OF POLYESTER AND EPOXY RESINS ON SHIPBOARD FUELS, by R. L. Walsh. 15 Mar 57, 16p. 3 refs. Research and Development rept. 070357B.
Order from LC mi$2.40, ph$3.30 PB 140 378

All data and tables are coded so as not to reveal manufacturer's identity. The compatibility of nine polyester and five epoxy resin glass-cloth reinforced laminates with shipboard fuels was investigated. Test strips of the materials were immersed in aviation gasoline, JP-4 jet engine fuel, marine diesel fuel, and Navy Special fuel and stored for six months at 110°F. Four of the laminates tended to increase the gum content of the aviation gasoline. These four laminates and four others were permeable to the fuels. The remaining six laminates were impermeable and did not affect the quality of the fuels.

Rocketdyne, Canoga Park, Calif.
THE MOTION AND SHATTERING OF BURNING AND NONBURNING PROPELLANT DROPLETS, by E. Rabin and R. Lawhead. Rept. on Contract AF 18(603)98. 25 Mar 59, 52p. 12 refs. R-1503; AFOSR TR-59-129; AD-210 768.
Order from LC mi$3.60, ph$9.30 PB 140 621

Studies have been conducted in a one-inch-square shock tube to determine the effect of shock waves in the breaking up of burning and non-burning liquid fuel droplets.

Springfield Armory, Mass.
A METHOD OF RECLAIMING CUTTING FLUID (WASH WASTE) BY MEANS OF HOMOGENIZATION, by Leo Krasnor. Rept. on Study of Production Equipment Processes for Modernization of Forging, Plating, Metal-finishing, Salvage, Electronic Control, Machineability, and Process Controls. 22 Nov 58, 8p. SA-TR16-1056.
Order from LC mi$1.80, ph$1.80 PB 140 741

An investigation was made to determine the feasibility of reclaiming cutting fluids (wash waste) for use as an emulsifiable cutting fluid by means of a homogenization process. Limited tests indicate that cutting fluid reclaimed by this process is equal to commercially obtainable emulsifiable cutting fluids. Test procedure is described, and results discussed.

Paints and Finishes

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
VOLUMETRIC DETERMINATION OF PHTHALIC ANHYDRIDE IN CERTAIN MODIFIED ALKYD RESINS, by G. G. Esposito. 3 Dec 58, 8p. Rept. no. CCL #68.
Order from OTS $0.50 PB 151 526

A volumetric method involving nonaqueous titration was developed for general application to the determination of phthalic anhydride and the isomeric phthalic acids in all types of modified alkyd resins. In many of the modified alkyds, insoluble precipitates other than dipotassium phthalate form during saponification and the usual gravimetric method of analysis is unsuitable. The volumetric method is less time-consuming than the ultraviolet method and requires no special equipment.

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT OF TANK COATINGS APPLIED AFTER CHEMICAL DESCALING, by M. Acampora and I. Geld. Final rept. 29 May 58, 13p. Lab. project 5686-3.
Order from LC mi$2.40, ph$3.30 PB 140 507

Various tank coating systems, including amine and polyamide cured epoxy, coal tar epoxy, saran and thiokol were applied to acid-descaled steel surfaces. Immersion tests were conducted to determine resistance of the coatings to fuel and salt water. Sand-

blasted surfaces were employed as controls. Five of the coating systems, all epoxy-resin types, were found to give satisfactory adhesion to the base steel with no significant blistering or other surface changes, and good resistance to hydrocarbon jet fuel.

Rock Island Arsenal Lab., Ill.
CELLULAR PLASTISOL FOR ORDNANCE HANDWHEELS, by Donald H. Sale. 6 Aug 58, 17p. Technical rept. no. 58-2034.
Order from OTS $0.50 PB 151 535

A study was made of plastisols compounded to form cellular coatings for use on metal handwheels at high and low ambient temperatures for the purpose of reducing heat transfer to and from the human hand. These coatings were evaluated for low temperature brittleness, resistance to blocking, uniformity of cells and other properties. Two coatings were found to be worthy of field evaluation testing.

Plastics

Army Engineer Research and Development Labs., Fort Belvoir, Va.
FINE STRUCTURE STUDY OF SEVERAL PLASTIC POLYMERS, by Herbert Duey. 10 June 58, 27p. 3 refs. Rept. no. 6124-1.
Order from LC mi$2.70, ph$4.80 PB 140 612

The plastics under investigation were studied by observing the appearance of their fractured surfaces. Fractures were obtained under both creep and impact conditions using standard laboratory test equipment. The surfaces of the fractures were then studied by making replicas of the surfaces and observing the replicas by means of the electron microscope.

Army Prosthetics Research Lab., Washington, D. C.
EFFECT OF LATEX AGE ON PHYSICAL PROPERTIES OF "ACRYLATE AMIDE" CAST FILM, by Guy A. Hanks. 27 Feb 58, 11p. 5 refs. Technical rept. no. 5805.
Order from LC mi$2.40, ph$3.30 PB 140 241

Physical properties of "Acrylate-Amide" films cast from formaldehyde free latex emulsions and aged for several weeks are substantially constant. When formaldehyde is compounded in the emulsion and aged, gradual vulcanization occurs in the latex as has been previously reported[1]. This report deals with the effect of latex age on physical properties of cast film subsequently treated with a cross linking agent which improves the surface properties of this material for cosmetic application.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING. TASK XXVI. INVESTIGATIONS OF SURFACE RESISTANCE AND VOLUME RESISTIVITY OF FOIL-CLAD LAMINATES, by J. Lewis, II and P. G. Perry. Final rept. on Contract DA 36-039-sc-63136. 1 Oct 55, 62p. AD-115 177.
Order from LC mi$3.90, ph$10.80 PB 136 728

Specimen material sheets were procured from seven specified manufacturers. The specimen materials as received from the manufacturer were in sheets 36 x 42 x 1/8 inch faced two sides with 0.00135 inch copper foil. These material sheets were etched from each copper surface. These etched specimens, in appropriate groups by make and type, were investigated for surface and volume resistances before, during, and after each of the following exposures: (1) 96 hours exposure at + 65 C and 90-95% relative humidity. (2) 10 days exposure to temperatures cycled from + 25 C to 65 C at a constant relative humidity of 90-95%.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
DEVELOPMENT OF 400-GALLON TANK OF GLASS-REINFORCED PLASTIC, by Theodore Fruchtman, Julius I. Gnapp, and Alvin A. Hass. Apr 59, 24p. 12 refs. Technical rept. 2560; AD-208 860.
Order from LC mi$2.70, ph$4.80 PB 140 230

The object was to design and develop for the transportation of water a 400-gallon plastic tank which will be an improvement over metal tanks. This objective was later expanded to include a suspension system adaptable to existing trailers.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EVALUATION OF A CASTABLE COMBUSTIBLE CONDUCTIVE PLASTIC, by William C. Tanner. July 58, 17p. Technical rept. 2496. AD-158 202.
Order from LC mi$2.40, ph$3.30 PB 135 941

A commercial polyester resin, Laminac 4134, was modified by the addition of graphite, ammonium perchlorate, and additional styrene monomer to produce a series of castable, conductive plastic materials. A volume resistivity as low as 0.75 ohm-cm, measured at 73.5° F and 50% relative humidity, was obtained. For a particular composition little change in volume resistivity was observed between -65° F and 165° F. Compositions containing approximately 20% ammonium perchlorate burn in air, leaving a soft powdery residue consisting essentially of graphite. These compositions can be cast and are easily machined.

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
FINAL REPORT FOR 1 FEB 56-30 JUNE 57. Rept. on Contract Nonr-1129(00). June 58, 27p.
Order from LC mi$2.70, ph$4.80 PB 140 541

The object was to investigate in detail the various factors which pertain to the adsorption of polymers from solution on to solid surfaces. Polyvinyl acetate was selected for investigation under a great variety of conditions.

Material Lab., New York Naval Shipyard, Brooklyn.
SPECIFICATION DEVELOPMENT REPORT ON HIGH IMPACT POLYESTER RESINS, by J. Kaminetsky. Final rept. 29 Sep 58, 11p. Lab project 5972-1.
Order from LC mi$2.40, ph$3.30 PB 140 502

The object of this evaluation was to investigate the properties of a limited number of high impact polyester resin systems to obtain information on which to base a proposed specification. This specification will cover two types of resin systems, namely, a general purpose high impact grade, and a fire-retardant high impact grade.

Material Lab., New York Naval Shipyard, Brooklyn.
SPECIFICATION DEVELOPMENT REPORT ON REPAIR KIT FOR REINFORCED PLASTICS, by George J. Dashefsky. Final rept. 26 Sep 58, 10p. Lab project 5830-10.
Order from LC mi$1.80, ph$1.80 PB 140 508

The objectives were to obtain data for use as a basis for establishing requirements and test procedures for filled paste epoxy resin-hardener systems used for repairs to reinforced plastics, and to prepare a revision of the specification on "Repair Kit, Glass Reinforced Plastic Laminate", and to prepare a revision of the instructions for using the repair kit.

Rome Air Development Center, Griffiss AFB, N. Y.
HIGH DENSITY FOAM-IN-PLACE EDGE BAND FOR PREFABRICATED PANELS, by Joseph M. Schramp. Jan 59, 17p. RADC TN-58-334; AD-205 923.
Order from OTS $0.50 PB 151 628

This report describes the considerations which resulted in the unique and satisfactory utilization of high density polyurethane self expanding plastic as the edge banding for a prefabricated panel.

Watertown Arsenal Labs., Mass.
THE TOTAL NORMAL THERMAL EMISSIVITY OF TEFLON, KEL-F, AND DUROID 5600 AT ELEVATED TEMPERATURES, by Albert F. Grenis and Anthony K. Wong. Rept. on Fluorocarbon Plastics, Emissivity. July 58, 15p. 10 refs. Rept. no. WAL TR 397.1/1.
Order from LC mi$2.40, ph$3.30 PB 140 240

The total normal emissivities at elevated temperatures for the fluorocarbon plastics Teflon, Duroid 5600, and Kel-F were determined by a comparison method. The method is one in which proportionate values of the thermal emissive power of a test specimen and a blackbody reference were first obtained at a given temperature, and then the emissivity was determined. The temperature range extended from 225°F to that approaching the gel-points of the respective materials. The mean value of emissivity for Teflon was found to be 0.88; Duroid 5600, 0.78; and Kel-F, 0.92.

Material Lab., New York Naval Shipyard, Brooklyn, N. Y.
ESTABLISHMENT OF INDEX VALUES FOR RESIDUAL STRENGTH OF SPECIFICATION GRADE WHITE OAK AFTER STEAM-BENDING, by J. M. Richolson. Final rept. 19 Dec 58, 40p. 19 refs. Lab project 5090-3, pt. 6.
Order from LC mi$3.00, ph$6.30 PB 140 675

Specimens of "green" white oak were steam-bent in the Material Laboratory's bending machine into small curved beams. The residual strength after bending was determined from static bending tests by comparing values for "apparent" fib. stress at prop. limit, mod. of ideas and rupture with similar values for matched straight beams. Simple beam equations were applied after adjusting vertical deflection data for changing span of curved beams.

Material Lab., New York Naval Shipyard, Brooklyn.
ESTABLISHMENT OF TREND CURVES FOR THE CORROSIVITY OF FIVE COMMON SHIPBUILDING WOODS TO FIVE CLASSES OF METAL WOOD SCREWS, by George J. Dashefsky. Final rept. 23 Jan 59, 46p. 15 refs. Lab. project 5090-3, pt. 4.
Order from OTS $1.25 PB 151 795

A description of the results of testing wood screws of bright steel, galvanized steel, brass, chromium-plated brass, and silicon bronze that were attached to white oak, teak, mahogany, cypress, and fir, then exposed to salt fog and sea water immersion tests. Beeswax lubricant is partially effective in reducing corrosion of metal fasteners.

Naval Research Lab., Washington, D. C.
MARINE BORER CONTROL, PART 8. DISTILLATION RESIDUE STUDIES, by T. R. Sweeney and T. R. Price. Interim rept. 30 Apr 59, 12p. 10 refs. NRL rept. 5314.
Order from LC mi$2.40, ph$3.30 PB 139 730

Four distillation fractions of coal tar creosote were combined respectively with the distillation residue and the resulting solutions tested for their ability to impart to wood a resistance to marine borer attack. In addition, to determine the proportion of residue necessary to enable creosote to impart its maximum protection to wood, series of wooden panels were impregnated with creosotes containing varying percentages of residue and the relative resistance of these treated panels to marine borer attack was determined. All of the creosote distillation fractions studied as fraction-residue solutions conferred upon wood a resistance to marine borer attack, although the resistance to Teredinidae attack was much greater than the resistance to Limnoria attack. The effectiveness of the fractions against Teredinidae increased with increasing boiling point up to 210°C/15 mm; no similar relationship was apparent with Limnoria. A residue content between 15% and 50% enabled creosote to confer its maximum protection upon treated wooden panels. The rate of loss of creosote from impregnated wooden panels leached with flowing fresh water

at 80° C was roughly inversely proportional to the residue content of the creosote. (See also PB 121 532)

Timber Engineering Co., Washington, D. C.
STUDY OF AN ACCELERATED STEAMING AND DRYING DELAMINATION TEST TO DETERMINE QUALITY OF EDGE JOINTS IN SINGLE WHITE OAK LAMINATIONS, by Robert J. Miller. Rept. on Contract NObs-72189. 10 Sep 58, 22p.
Order from LC mi$2.70, ph$4.80 PB 140 526

The objective of this work was to determine the feasibility of using a short steaming and drying test on individual edge-glued boards to ascertain, in advance, the probable level of delamination that will occur in the same quality edge joints when they are tested in multiple laminate specimens by the standard 12-day cyclical exposure test and by a 3-hour oven-drying test.

Yale U. School of Forestry, New Haven, Conn.
IDENTIFICATION OF TROPICAL WOODS RESISTANT TO MARINE BORER ATTACK, by William L. Stern, Kenton L. Chambers, and George K. Brizicky. Final rept. on Contract Nonr-2308(00). May 58, 21p.
Order from LC mi$2.70, ph$4.80 PB 140 480

Some important collections were prepared. Table 1 contains a list of all collections of woody plants. Over 50 plant families are represented in these collections and well over 100 different species.

Watervliet Arsenal, N. Y.
LAMINATED MAPLE AS REAMER PACK MATERIAL, by William G. McEwan. 12 Nov 57, 10p.
Order from LC mi$1.80, ph$1.80 PB 140 713

This report details the type wood required for reamer packs; the defects which occur during the seasoning and processing of maple; also, adverse conditions encountered during production reaming which affect the physical properties of the pack.

MATHEMATICS

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE FUNDAMENTAL SOLUTION TENSOR FOR SYSTEMS OF LINEAR, CONSTANT COEFFICIENT, PARTIAL DIFFERENTIAL EQUATIONS, by Paul Berg and Gordon Latta. Rept. on Theoretical Study of Acoutical Energy Generation, Propagation and Receptions, Contract AF 33(616)2987. Nov 56, 13p. 2 refs. WADC Technical note 56-489; AD-110 564.
Order from LC mi$2.40, ph$3.30 PB 127 930

A formal method is developed for obtaining the fundamental solution matrix for systems of linear, partial differential equations with constant coefficients. The procedure involves the determination of an operator matrix, and the fundamental solutions of certain scalar equations derived from the given system. Application of the operator to the scalar fundamental solutions yields the required fundamental solution matrix.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON A THEOREM OF WERMER'S, by Halsey L. Royden. Technical rept. no. 9 on Contract DA 04-200-ORD-704. 22 Jan 59, 14p. 9 refs. AD-210 570.
Order from LC mi$2.40, ph$3.30 PB 140 560

A theorem of Wermer's states that, if W is a finite Riemann surface whose boundary Γ is homeomorphic to the unit circumference, then the algebra A of all functions continuous on $W \cup \Gamma$ and analytic in W is a maximal closed subalgebra of the algebra C of all continuous complex-valued functions on . A proof different from Wermer's is given whose principal tools are function-the-oretic and shows that it need not be assumed that Γ is connected, i.e., homeomorphic to the unit circumference. A slight modification of the proof yields an analogous result for the algebra of boundary values of bounded analytic functions.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
TABLES OF PARAMETERS (f, i) GIVING MINIMUM AVERAGE FRACTION INSPECTED FOR CSP-1, AND FOR A MULTI-LEVEL EXTENSION, by George J. Resnikoff. Technical rept. no. 38 on Contract N6onr-25126.
Order from LC mi$2.70, ph$4.80 PB 140 794

California U., Berkeley.
A CHARACTERIZATION OF INVARIANT AFFINE CONNECTIONS, by Bertram Kostant. Technical rept. no. 10 on Contract AF 49(638)79. Mar 59, 27p. 8 refs. AFOSR TN-59-208; AD-211 662.
Order from LC mi$2.70, ph$4.80 PB 140 426

One has always suspected that an affine connection on a manifold M which has the property of being invariant under a transitive Lie group operating on M should be distinguishable from an arbitrary affine connection by some geometry property. Recently Ambrose and Singer found such a property in the case of a Riemannian metric on a simply connected manifold. Here we obtain, in an entirely different way, a more general theorem. Our theorem characterizes, in a simple geometric way all simply connected reductive homogeneous spaces which are provided with invariant affine connections.

California U., Berkeley.
LOCALLY CONVEX LINEAR SPACES AND DISTRIBUTIONS, by Jacob Feldman. Technical rept. no. 1 on Contract Nonr-222(60). July 58, 33p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 140 464

The purpose of this discussion will be to give an introduction to the theory of topological linear spaces which underlies Schwartz's "distributions". An attempt has been made to avoid introducing more of

the abstract theory than is relevant to distribution theory. The presentation will be self-contained, with two exceptions: the Hahn-Banach theorem will not be proven, on the grounds that it is simple enough, and can be found in many places; and the proof of the generalized closed graph theorem depends on several theorems given elsewhere.

California U., Berekeley.
THE PRINCIPLE THREE-DIMENSIONAL SUBGROUP AND THE BETTI NUMBERS OF A COMPLEX SIMPLE LIE GROUP, by Bertram Kostant. Technical rept. no. 9 on Contract AF 49(638)79. Dec 58, 100p. 14 refs. AFOSR TN-58-1084; AD-207 581.
Order from LC mi$5.40, ph$15.30 PB 140 700

Carnegie Inst. of Tech., Pittsburgh, Pa.
A FUNCTION-THEORETIC SOLUTION OF CERTAIN INTEGRAL EQUATIONS I, by Albert E. Heins and Richard C. MacCamy. Technical rept. no. 35 on Mathematical Analysis of Electrical and Mechanical Systems, Contract DA 36-061-ORD-490. May 57, 19p. 4 refs. CIT-ORD-6D-TR35.
Order from LC mi$2.40, ph$3.30 PB 140 336

This report is concerned with the solution, by function theoretic methods, of a certain type of integral equation arising in the study of boundary problems for elliptic partial differential equations in two variables. The equation is converted into a functional relation for a multiple-valued analytic function defined on Riemann surface and the solution of this relation obtained. The method is carried out in detail for the integral equation of the Sommerfield half-plane problem.

Carnegie Inst. of Tech., Pittsburgh, Pa.
SOME EIGENVALUE ESTIMATES, by Zeev Nehari. Technical rept. no. 26 on Contract AF 49(638)227. Apr 59, 15p. 4 refs. AFOSR TN-59-331; AD-213 652.
Order from LC mi$2.40, ph$3.30 PB 140 533

The following two inequalities are proved: (a) If $p(x)$ is non-negative, monotonic and L^1 in $[a, b]$, and denotes the lowest eigenvalue of the system

$$y'' + \lambda p(x)y = 0, \quad y(a) = y(b) = 0,$$

then $$\lambda^{1/2} \int_a^b \sqrt{p(x)}\,dx > \frac{\pi}{2}.$$

(b) If, under the same conditions for $p(x)$, Λ is the lowest eigenvalue of

$$y^{IV} - \Lambda p(x)y = 0, \quad y(a) = y'(a) = y(b) = y'(b) = 0,$$

then $$\Lambda^{1/4} \int_a^b \sqrt[4]{p(x)}\,dx > k \sim 1.88,$$

where k is the smallest positive root of

$$\cos k \cosh k + 1 = 0.$$

Both constants are best possible. The inequalities are used to derive oscillation criteria for the equations $y'' + p(x)y = 0$ and $y^{IV} - p(x)y = 0$, respectively.

Columbia U., New York.
A NOTE ON PERFECT PROBABILITY, by Gopinath Kallianpur. Rept. on Contract AF 18(600)442. Feb 59, 10p. 6 refs. CU-46-59-AF 18(600)442-MS; AFOSR TN-59-210; AD-211 664.
Order from LC mi$1.80, ph$1.80 PB 140 417

The purpose of this note is to define and characterize a class of perfect probability spaces which we shall call D-spaces. Gnedenko and Kolmogorov seem to have been the first to introduce explicitly the notion of perfect measure, although a special case ("normal space") was studied by Halmos and von Neumann as long ago as 1942. An illuminating appendix by Doob testifies to the fact that the notion of perfectness of a measure has been well known to mathematicians for quite some time.

Columbia U., New York.
PERFECT PROBABILITY SPACES, by Gopinath Kallianpur. Rept. on Contract AF 18(600)442. Sep 58, 75p. 17 refs. CU-45-58-AF 18(600)-442-MS; AFOSR TN-58-808; AD-202 353.
Order from LC mi$4.50, ph$12.30 PB 140 371

Contents:
The basic theorems of perfect probability measures
Perfection and independence of random variables
Perfect measure and conditional probability distributions
Perfect measures on product spaces
A characterization of perfect space and some models of perfect probability spaces

Columbia U., New York.
SEQUENTIAL ESTIMATION OF THE MEAN OF A NORMAL POPULATION, by Herbert E. Robbins. Rept. on Contract AF 18(600)442. Aug 58, 17p. CU-43-58-AF 18(600)442-MS; AFOSR TN-58-800; AD-202 233.
Order from LC mi$2.40, ph$3.30 PB 136 873

The problem is considered of estimating the unknown mean μ of a normal population when the variance σ^2 of the population is also unknown. As estimator the sample mean $\bar{x}_n$ of a sample of size n is used, so that the problem is simply that of choosing n. (In particular consider two rules for determining n sequentially will be considered).

Cornell U., Ithaca, N. Y.
AN EXTREMUM PROBLEM, by Harold Widom. Rept. on 69 on Contract AF 18(600)685. Sep 57, 14p. 2 refs. AFOSR TN-57-536; AD-136 522.
Order from LC mi$2.40, ph$3.30 PB 135 984

Cornell U., Ithaca, N. Y.
NON-ABELIAN COHOMOLOGY AND VAN KAMPEN'S THEOREM, by Paul Olum. Rept. no. 68 on Contract AF 18(600)685. Aug 57, 19p. 3 refs AFOSR-TN-57-485; AD-136 478.
Order from LC mi$2.40, ph$3.30 PB 135 983

This paper has two purposes. In the first place, it develops material on cohomology with non-abelian

coefficients needed for later work in the homotopy classification of mappings; included in this is a Mayer-Vietoris sequence for non-abelian cohomology. Secondly, as an application of the Mayer-Vietoris sequence, it gives a new proof of (and generalizes considerably) the van Kampen theorem on the fundamental group of the union of two topological spaces.

Cornell U., Ithaca, N. Y.
ON THE PHRAGMEN-LINDELOF THEOREM AND SOME APPLICATIONS, by Hans Rademacher. Rept. no. 66 on Contract AF 18(600)685. Aug 57, 21p. 4 refs. AFOSR-TN-57-453; AD-136 443.
Order from LC mi$2.70, ph$4.80 PB 135 990

The Phragmén-Lindelöf theorem for a parallel strip is usually enunciated for a single function and contains a multiplicative constant possibly depending on the function. Here a statement of the theorem is evolved which is valid uniformly for an infinite set of functions and which is sharp. The basic idea is to use a special subharmonic function for a lower estimate of a harmonic function. Applications are made to families of $L(s, \chi)$-functions and $\zeta_k(s)$-functions with new results.

Cornell U., Ithaca, N. Y.
REAL ROOTS OF REAL DIRICHLET L-SERIES II, by J. Barkely Rosser. Rept. no. 72 on Contract AF 18(600)685. Oct 57, 32p. AFOSR-TN-57-631; AD-136 616.
Order from LC mi$3.00, ph$6.30 PB 135 985

We consider a real character χ (mod k) and the corresponding L-series, $L(s,\chi)$. We show that for $k \leq 986$ there are no positive zeros of $L(s,\chi)$ and that for $k \leq 40{,}000$ there are no zeros β with $0.99 \leq \beta$. These results have important applications to the distribution of primes in arithmetic progressions.

Cornell U., Ithaca, N. Y.
SPECTRAL SYNTHESIS FOR THE CIRCLE, by C. S. Herz. Rept. no. 73 on Contract AF 18(600)685. Nov 57, 7p. 3 refs. AFOSR-TN-57-694; AD-136 687.
Order from LC mi$1.80, ph$1.80 PB 135 980

Spectral synthesis holds for the (circumference of the) unit circle in Euclidean R^2.

Cornell U., Ithaca, N. Y.
STABLE PROCESSES WITH AN ABSORBING BARRIER, by Daniel Ray. [1957] 15p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 135 974

Duke U., Durham, N. C.
ELEMENTARY SOLUTION OF SOME DUAL INTEGRAL EQUATIONS, by Ian N. Snoddon. Rept. on Contract AF 18(600)1341. Mar 59, 6p. 7 refs. AFOSR-TN-59-363; AD-213 673.
Order from LC mi$1.80, ph$1.80 PB 140 535

Duke U., Durham, N. C.
A NOTE ON THE AXIALLY SYMMETRICAL PUNCH PROBLEM, by Ian N. Sneddon. Rept. on Contract AF 18(600)1341. Mar 59, 4p. 3 refs. AFOSR TN-59-362; AD-213 672.
Order from LC mi$1.80, ph$1.80 PB 140 534

Educational Testing Service, Princeton, N. J.
TRANSFORMATION OF PREDICTOR VARIABLES TO A SIMPLIFIED REGRESSION STRUCTURE, by Ledyard R. Tucker. Rept. on Contract Nonr-2130(00). Nov 57, 47p. 7 refs.
Order from LC mi$3.30, ph$7.80 PB 136 763

A system of regression equations for prediction of a number of criteria from a common battery of predictor variables is studied with consideration of the possibilities of linear transformations among the predictor variables. The criteria are taken as given and no transformations among criteria variables are considered. Weighted sums of predictor scores for each individual are taken as composite scores for that individual. When as many independent composites as original predictors are obtained, these composites provide identical estimates of criterion scores as do the original variables.

Hebrew U. (Israel).
GENERALIZATION OF THE LOTOTSKY METHOD OF SUMMABILITY, by Amnon Jakimovski. Technical note no. 8 on Contract AF 61(052)04. June 58, 31p. 8 refs. AFOSR TN-58-674; AD-162 206.
Order from LC mi$3.00, ph$6.30 PB 136 869

In a recent paper, A. V. Lototsky introduced a new method of summability which possesses interesting and important properties. Later, R. P. Agnew gave simplified proofs of Lototsky's results as well as some further properties of the above method. In this paper it is shown that many results proved for the Lototsky, or L_1 method of summability are valid for a general class of transformations to which the L transformation belongs.

Hebrew U. (Israel)
RESEARCH IN THE AREA OF MATHEMATICAL ANALYSIS, by A. Jakimovski, B. Grünbaum and others. Technical final rept. for 1 July 57-30 June 58 on Contract AF 61(052)04. July 58, 28p. 4 refs. AFOSR TR-58-111; AD-201 859.
Order from LC mi$2.70, ph$4.80 PB 136 738

As a result of these investigations the following Technical Notes were issued: Tech. Note No. 1, Some remarks on Tauberian theorems, by A. Jakimovski. Tech. Note No. 2, Extensions, retractions and projections, by B. Grünbaum. Tech. Notes No. 3 & 4 (combined), On a theorem of Kirszbraun & On a problem of S. Mazur, by B. Grünbaum. Tech. Note No. 5, The coerciveness problem for integro-differential forms, by S. Agmon. Tech. Note No. 6, Projection constants, by B. Grünbaum. Tech. Note No. 7, Classes of minimal and representative domains and their Bergman kernel function, by M. Maschler. Tech. Note No. 8, A generalization of the Lototsky method of summability, by A. Jakimovski.

Institute of Mathematical Sciences, New York U., N. Y.
DIFFRACTION BY AN ELLIPTIC CYLINDER, by Bertram Levy. Rept. on Contract AF 19(604)1717. Dec 58, 36p. 6 refs. Research rept. no. EM-121; AFCRC-TN-59-103; AD-208 235.
Order from LC mi$3.00, ph$6.30 PB 140 403

The boundary value problem corresponding to a cylindrical wave incident upon an acoustically soft or acoustically hard elliptic cylinder is formulated and solved by the usual separation of variables technique. This solution is then asymptotically expanded for large values of kh $2\pi h/\lambda$, where λ is the wavelength, and h is one half the interfocal distance of the generating ellipse of the cylinder. The short wave length expansion of the field is also obtained by applying the newly developed geometrical diffraction theory, and compared with the asymptotic expansion of the diffracted field. For both the soft and hard cylinders it is shown that the geometrical solution is the leading term of the asymptotic expansion of the exact solution.

Institute of Statistics, U. of North Carolina, Chapel Hill.
ANALYSIS OF VARIANCE WITH UNIVARIATE OR MULTIVARIATE, FIXED OR MIXED CLASSICAL MODELS, by S. N. Roy and J. Roy. Rept. on Contract AF 49(638)213. Aug 58, 140p. Mimeograph series no. 208; AFOSR TN-58-850; AD-203 491.
Order from LC mi$6.90, ph$21.30 PB 140 676

Contents:
Elements of vector and matrix algebra
Matrix computations
Univariate analysis of variance with fixed effects
Multivariate analysis of variance with fixed effects
Applications

Institute of Statistics, U. of North Carolina, Chapel Hill.
CONTRIBUTIONS TO UNIVARIATE OR MULTIVARIATE ANALYSIS OF VARIANCE WITH FIXED EFFECTS, NORMAL OR NONNORMAL RANDOM EFFECTS, AND NORMAL ERROR, by S. N. Roy and Whitfield Cobb. Rept. on Contract AF 49(638)213. Dec 58, 149p. 21 refs. Mimeograph series no. 214; AFOSR-TN-59-217; AD-211 779.
Order from LC mi$7.20, ph$22.80 PB 140 355

Contents:
Mathematical preliminaries
Univariate model: Designs and statistics
Univariate model: Estimates, tests, and confidence bounds
Multivariate model: Designs and statistics
Multivariate model: Tests and confidence bounds

Institute of Statistics, U. of North Carolina, Chapel Hill.
MULTI-DIMENSIONAL INCOMPLETE BLOCK DESIGNS, by S. N. Roy and R. F. Potthoff. Rept. on Contract AF 49(638)213. Nov 58, 268p. 13 refs. Mimeograph series no. 211; AFOSR TN-59-68; AD-209 843.
Order from LC mi$11.10, ph$41.10 PB 140 622

Contents:
Analysis of multi-dimensional incomplete block designs for models with no interaction terms
Analysis of multi-dimensional incomplete block designs for models with interaction terms
Some examples of multi-dimensional incomplete block designs, and methods of constructing them
Certain extensions of the theory of multi-dimensional incomplete block designs

Institute of Statistics, U. of North Carolina, Chapel Hill.
A NOTE ON A RESULT IN THE THEORY OF CODE CONSTRUCTION, by R. C. Bose and S. S. Shrikhande. Rept. on Contract AF 49(638)213. Jan 59, 17p. 13 refs. Mimeograph series no. 217; AFOSR TN-59-213; AD-211 772.
Order from LC mi$2.40, ph$3.30 PB 140 418

This paper establishes a connection between Hadamard matrices and a problem in the theory of code construction.

Institute of Statistics, U. of North Carolina, Chapel Hill.
A NOTE ON CONFIDENCE BOUNDS CONNECTED WITH ANOVA AND MANOVA FOR BALANCED AND PARTIALLY BALANCED INCOMPLETE BLOCK DESIGNS, by V. P. Bhapkar. Rept. on Contract AF 49(638)213. Jan 59, 13p. 3 refs. Mimeograph Series no. 216; AFOSR TN-59-88; AD-210 088.
Order from LC mi$2.40, ph$3.30 PB 140 546

Institute of Statistics, U. of North Carolina, Chapel Hill.
A NOTE ON J. ROY'S "STEP-DOWN PROCEDURE IN MULTIVARIATE ANALYSIS", by V. P. Bhapkar. Rept. on Contract AF 49(638)213. Dec 58, 8p. 2 refs. Mimeograph series no. 212; AFOSR-TN-59-69; AD-209 844.
Order from LC mi$1.80, ph$1.80 PB 140 544

Test procedures in multivariate analysis are usually based on the λ-criterion or a criterion in terms of the largest and/or the smallest characteristic roots of certain matrices, each criterion being a special case of the general union-intersection principle. An alternative procedure, called the step-down procedure, has been used by Roy and Bargmann [2] in devising a test of multiple independence between variates distributed according to the multivariate normal law. This procedure again can be derived as a special case of the union-intersection principle. This procedure has been recently applied to multivariate analysis of variance by Roy [1] in deriving new tests of significance and simultaneous confidence-bounds on a number of "deviation-parameters." In this note the same procedure is applied to test multiple independence of normal variates under a general linear model.

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON AN OPTIMUM PROPERTY OF SOME BECHHOFER SOBEL NON-SEQUENTIAL MULTIPLE-DECISION RULES, by William Jackson Hall. Rept.

on Contract AF 49(638)261. Nov 58, 9p. 9 refs. Mimeograph series no. 210; AFOSR TN-59-216; AD-211 778.
Order from LC mi$1.80, ph$1.80 PB 140 590

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON THE FALSITY OF EULER'S CONJECTURE ABOUT THE NON-EXISTENCE OF TWO ORTHOGONAL LATIN SQUARES OF ORDER 4t+2, by R. C. Bose and S. S. Shrikhande. Preliminary rept. on Contract AF 49(638)213. Mar 59, 7p. 5 refs. Mimeograph Series no. 220; AFOSR TN-59-277; AD-212 711.
Order from LC mi$1.80, ph$1.80 PB 140 629

The purpose of this paper is to prove a general theorem on the existence of pairwise orthogonal Latin squares (p. o. l. s.) of a given order and to give a counter example to Euler's conjecture that there do not exist two p. o. l. s. of order 4t+2.

Institute of Statistics, U. of North Carolina, Chapel Hill.
RELATION BETWEEN CERTAIN INCOMPLETE BLOCK DESIGNS, by S. S. Shrikhande. Rept. on Contract AF 49(638)213. July 58, 14p. 11 refs. Mimeograph series no. 207; AFOSR TN-58-699; AD-162 233.
Order from LC mi$2.40, ph$3.30 PB 140 632

Relations between balanced incomplete block designs derived from the symmetrical balanced incomplete block designs with $\lambda = 1$ and 2 and certain partially balanced incomplete block designs are investigated in this paper.

Institute of Statistics, U. of North Carolina, Chapel Hill.
SOME NONPARAMETRIC ANALOGUES OF 'NORMAL' ASSOCIATION, by S. N. Roy and V. P. Bhapkar. Rept. on Contract AF 49(638)213. Jan 59, 34p. 5 refs. Mimeograph series no. 215; AFOSR TN-59-70; AD-209 845.
Order from LC mi$3.00, ph$6.30 PB 140 545

Johns Hopkins U., Baltimore, Md.
FINAL REPORT, by G. D. Mostow. Rept. for 1 Aug 55-31 July 58 on Contract AF 18(600)1474. July 58, 5p. 7 refs. AFOSR-TR-58-101; AD-162 219.
Order from LC mi$1.80, ph$1.80 PB 136 866

The research performed under this contract dealt for the most part with two facets of the theory of Lie groups which involve distinctively different methods of analysis. On the one hand, problems relating to the representations of a Lie group by linear transformations of a linear space, on the other, problems relating to the operations of a Lie group as a group of topological transformations on a manifold.

Laboratory of Statistical Research, U. of Washington, Seattle.
THE STATISTICAL THEORY OF SOME MIGRATION POPULATION MODELS, by D. G. Chapman and R. Pyke. Technical rept. no. 22 on Contract N8onr-520, T. O. 2. [1955] 30p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 127 181

A number of statistical models of population migration are set up. The problem studied is that of estimating the various population parameters associated with a migration between two areas. Estimators for the unknown parameters are derived and approximate formulae for their expectations and variances, along with the conditions necessary for the suitability of the approximations, are given. The populations considered are dichotomous, a property that is frequently satisfied in reality besides affording greater mathematical simplicity than would otherwise be possible. Also, the populations are assumed to be free from the influences of birth and death (or if present, these factors are known and can be accounted for) during the time intervals desired. For the most part the theory is designed for large populations.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
THE LOCAL BEHAVIOR OF SOLUTIONS OF THE TWO-BODY PROBLEM AND RELATED PROBLEMS, by J. J. Levin. Rept. on Contract AF 19(122)458. 16 June 58, 30p. 16 refs. Technical rept. no. 182; AD-133 855.
Order from LC mi$2.70, ph$4.80 PB 140 395

The local behavior of solutions of the two-body problem is investigated. Relations between the relative position and velocity of solutions that are close together are obtained under various hypotheses. A first-order linear approximation to the equations of motion is used. The analysis is given in a rather general setting for which the two-body problem is a special example. The matrix Riccati equation plays a key role in this investigation.

Louisiana State University, Baton Rouge,
CLANS WITH ZERO ON AN INTERVAL, by Haskell Cohen and L. I. Wade. Rept. on Contract AF 18(603)89, 14 Jan 57, 21p. 8 refs. AFOSR-TN-57-34; AD-115 072.
Order from LC mi$2.70, ph$4.80 PB 135 992

Louisiana State U., Baton Rouge.
HOMOMORPHISMS AND TOPOLOGICAL SEMIGROUPS, by N. J. Rothman. Rept. on Contract AF 18(603)89. 11 Sep 58, 14p. 13 refs. AFOSR TN-58-741; AD-201 507.
Order from LC mi$2.40, ph$3.30 PB 136 854

The purpose of this paper is to discuss some of the structure of compact commutative Hausdorff topological semigroups. We will consider the characters (continuous complex-valued homomophisms) of such semigroups and obtain some results analogous to the character theory of locally compact commutative groups.

Louisiana State U., Baton Rouge.
ON THE SEMIGROUP STRUCTURE OF CONTINUA, by R. P. Hunter. Rept. on Contract AF 18(603)89. 11 Sep 58, 22p. 22 refs. AFOSR TN-58-740; AD-201 506.
Order from LC mi$2.70, ph$4.80 PB 136 853

Louisiana State U., Baton Rouge.
ORDERED SEMIGROUPS IN PARTIALLY ORDERED SEMIGROUPS, by R. J. Koch. Rept. on Contract AF 18(603)89. 11 Sep 58, 7p. 6 refs. AFOSR TN-58-739; AD-201 505.
Order from LC mi$1.80, ph$1.80 PB 136 852

In this note we show that a locally compact connected partially ordered local semigroup with unit contains a compact connected linearly ordered local subsemigroup (containing the unit). This is an extension of a theorem of Gleason. It follows that a compact connected partially ordered semigroup with unit and zero contains a standard thread joining the zero to the unit.

Naval Proving Ground, Dahlgren, Va.
USE OF ORTHONORMAL POLYNOMIALS IN FITTING CURVES AND ESTIMATING THEIR FIRST AND SECOND DERIVATIVES, by J. E. Barker. Rev. 2 June 58, 72p. NPG rept. no. 1553, NAVORD rept. no. 5138, 1st revision.
Order from LC mi$4.50, ph$12.30 PB 140 351

Consideration is directed to the use in least-squares problems of polynomials so constructed as to be orthonormal with respect to summation over a set of discrete data points. Recurrence formulas for the generation of such polynomials and their coefficients are given. The role which these polynomials play in obtaining least-squares estimates of first and second derivatives and in obtaining measures of the reliability of such estimates is discussed at some length. Brief consideration is also given to the problem of so designing experiments involving position-time measurements as to obtain the most reliable extimates of velocity and acceleration. This is followed by a discussion of the difficult problem of determining the proper degree of polynomial fit to the data points.

Naval Proving Ground, Dahlgren, Va.
USE OF ORTHONORMAL POLYNOMIALS IN FITTING CURVES AND ESTIMATING THEIR FIRST AND SECOND DERIVATIVES. SUPPLEMENT 1, TABLE 1. 2 June 58, 104p. NPG rept. no. 1553, NAVORD rept. no. 5138, 1st. revision.
Order from LC mi$5.70, ph$16.80
PB 140 351S-1, TAB-1
See PB 140 351.

Naval Proving Ground, Dahlgren, Va.
USE OF ORTHONORMAL POLYNOMIALS IN FITTING CURVES AND ESTIMATING THEIR FIRST AND SECOND DERIVATIVES. SUPPLEMENT 1, TABLE 2. 2 June 58, 122p. NPG rept. no. 1553, NAVORD rept. no. 5138, 1st. revision.
Order from LC mi$6.30, ph$19.80
PB 140 351S-1, TAB-2
See PB 140 351

Polytechnic Inst. of Brooklyn, N. Y.
HIGH ORDER CORRECT DIFFERENCE SCHEMES FOR MULTI-DIMENSIONAL PARABOLIC EQUATIONS, by J. R. N. Radok and K. Wang. Rept. on Contract AF 49(638)302. Mar 59, 14p. 4 refs. PIBAL rept. no. 492; AFOSR TN-59-329; AD-213 676.
Order from LC mi$2.40, ph$3.30 PB 140 532

Compatibility conditions for explicit difference schemes for multi-dimensional parabolic equations have been established with the object of securing high order truncation errors. A relationship between the coefficients of the multi-dimensional and the one-dimensional schemes has been deduced which provides a convenient means for their evaluation.

Purdue U., Lafayette, Ind.
ON SOME THEOREMS CONCERNING THE EQUALITY OF LEBESGUE AND PEANO AREAS, by Lamberto Cesari and Togo Nishiura. Technical note no. 15 on Analytical Theory of Continuous Transformations, Contract AF 18(600)1484. Feb 58, 25p. AFSOR-TN-58-329; AD-154 233.
Order from LC mi$2.70, ph$4.80 PB 135 977

Stanford U., Calif.
BERNOULLI UTILITY INDICATORS FOR DISTRIBUTIONS OVER ARBITRARY SPACES, by Kenneth J. Arrow. Technical rept. no. 57 on Contract N6onr-25133. 30 July 58, 12p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 140 201

Daniel Bernoulli first advanced the hypothesis that choice among probability distributions could be represented by comparison of expected utilities. That is, in modern notation, for a given space X, there exists a utility function U(x) such that for any two probability distributions p^1 and p^2 over X, p^1 is preferred to p^2 if and only if $\int U(x)\,dp^1 > \int U(x)\,dp^2$. Bernoulli himself was, of course, primarily concerned with the case where X is the space of non-negative real numbers, representing amounts of money.

Virginia U., Charlottesville.
ON THE CONSTRUCTION OF PERIODIC MAPS WITHOUT FIXED POINTS, by P. E. Conner and E. E. Floyd. Technical note no. 9 on Topology and Mathematical Analysis, Contract AF 49(638)72. Oct 58, 15p. 6 refs. AFOSR TN-59-81; AD-210 141.
Order from LC mi$2.40, ph$3.30 PB 140 238

We will consider the existence problem for fixed points of periodic maps. When the period is prime power, the theorem of P. A. Smith is available. That is, if X is a locally compact, finite dimensional space whose mod p Čech cohomology groups are trivial, and if $T:X \longrightarrow X$ is of period p^n where p is a prime, then T has a fixed point. It is shown here that such propositions are false in case the period is not prime power.

Washington U., Seattle.
ANOTHER GENERALIZATION OF HOPF INVARIANT, by Yasuro Tomonaga. Technical rept. no. 4 on Contract Nonr-477(15). 1 July 58, 36p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 140 699

Washington U., Seattle.
DENSE FAMILIES OF CONTINUOUS SELECTIONS, by Ernest Michael. Technical rept. no. 2 on Contract Nonr-477(21). July 58, 10p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 140 469

Let X be a metric space, Y a Banach space, $\mathcal{C}(Y)$ the family of non-empty, closed, convex subsets of Y, and let $\phi: X \to \mathcal{C}(Y)$ be lower semi-continuous (i.e. $\{x \in X / \phi(x) \cap U \neq \emptyset\}$ is open in X for every open $U \subset Y$). Under these circumstances, it was proved that there exists a selection f for ϕ, that is, a continuous $f: X \to Y$ such that $f(x) \in \phi(x)$ for every $x \in X$. In the present paper, this result is applied to prove Theorem 1.1 below and some of its consequences.

Washington U., Seattle.
PARACONVEX SETS, by Ernest Michael. Technical rept. no. 1 on Contract Nonr-477(21). July 58, 10p. 5 refs.
Order from LC mi$1.80, ph$1.80 PB 140 468

The principal purpose of this paper is to show that some of the desirable topological properties of convex subsets of a Banach space remain valid for a larger class of sets, which we call paraconvex.

Washington U., Seattle.
YET ANOTHER NOTE ON PARACOMPACT SPACES, by E. Michael. Technical rept. no. 3 on Contract Nonr-477(21). July 58, 13p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 140 470

Wayne State U., Detroit, Mich.
THE EXPONENTIAL DISTRIBUTION AND ITS ROLE IN LIFE TESTING, by Benjamin Epstein. Technical rept. no. 2 on Contract Nonr-2163(00). 1 May 58, 23p. 17 refs.
Order from LC mi$2.70, ph$4.80 PB 140 703

Computing Devices

Air Force Cambridge Research Center, Bedford, Mass.
AN ANALOG PULSE TO DC DECODER AND CONVERTER TACS EXPERIMENTAL SYSTEM: SERVICE MANUAL, by A. R. McKinney. Jan 59, 31p. AFCRC-TR-59-106; AD-209 903.
Order from LC mi$3.00, ph$6.30 PB 140 414

This service manual provides a means of converting remote Cartrac data, that has been stored on a high-speed magnetic drum in digital form and converted to analog pulse form, to dc voltages which may be fed into the Air Map. There, it is used to compute pertinent data for the control of aircraft.

Air Force Cambridge Research Center, Bedford, Mass.
THE SPACE CARD: A TWO-DIMENSIONAL FUNCTION GENERATOR, by Charles M. Jones and George Harpell. June 58, 21p. AFCRC TR-58-157; AD-152 436.
Order from OTS $0.75 PB 151 524

The space card is a printed-circuit card covered with a thin even film of hard resistive material. Electrically exciting the card at several points yields a predetermined geometric electric field. When the magnitude of the electric field is made a function of its physical position, the function is two-dimensional and can be read out by positioning a brush contact on the card. The technique is especially applicable to two-dimensional analog function generation for analog computation. This report describes the physical and electrical characteristics of the space card, methods of construction, theory of excitation, life-testing, advantages and disadvantages. Accuracies to 0.1 percent, long life, and stable operation are confirmed.

Air Proving Ground Center, Elgin AFB, Fla.
ACCEPTANCE TEST OF HIGH-SPEED COMPUTER OUTPUT PRINTER SYSTEM, by Heyward H. Strong, Jr. Armament test rept. July 58, 17p. APGC TR-58-66; AD-152 055.
Order from LC mi$2.40, ph$3.30 PB 140 462

The system is a device which prints and/or records data on line from a large-scale electronic digital computer. The purpose of the test was to determine whether the reliability and usability of the system meets the requirements of the Air Proving Ground Center. The system in its present form is reliable and satisfies the APGC requirements for a high-speed computer output printer system.

Dynamic Analysis and Control Lab., Mass Inst. of Tech., Cambridge.
FEASIBILITY STUDY OF A HIGH-SCANNING-RATE PHOTOGRAPHIC STORAGE DEVICE, by D. M. Baumann. First summary rept. RM-2 on Contract Nonr-1841(41). 1958, 83p. 13 refs. AD-203 799.
Order from LC mi$4.80, ph$13.80 PB 140 681

Electronics Research Lab., U. of California Berkeley.
CONTRIBUTION TO STATISTICAL DESIGNING OF SAMPLED-DATA CONTROL SYSTEM, by T. T. Nishimura and E. I. Jury. Rept. on Contract AF 18(600)1521. 163p. 21 refs. IER Series no. 60, Issue no. 210; AFOSR TN-58-613; AD-162 141.
Order from LC mi$7.80, ph$25.80 PB 140 677

This paper presents the derivation of the optimum discrete compensator for the continuous-discrete sampled-data control system by means of the modified z-transform. A convenient expression for the discrete power spectral density is introduced in order to solve the complicated problem of the continuous-discrete systems. The idea of the modified z-transform with a fictitious advance is adopted in order to keep the symmetry with the modified z-transform in the ordinary sense. In addition, the meaning of the modified z-transform of the power spectral density is explained. The general optimization procedures are demonstrated for the ordinary feedback system with a discrete compensator in the forward path, the feedback system with a pure delay in it, and the feedback system with a discrete compensator in the feedback

path. The power spectral densities in the system with finite pulse width, as well as the multiple, multirate, and mixed sampling systems are derived.

Hycon Eastern, Inc., Cambridge, Mass.
EVALUATION OF THE MAJORITY PRINCIPLE AS A TECHNIQUE FOR IMPROVING DIGITAL SYSTEM RELIABILITY, by J. McReynolds. Annual rept. no. 1 for period ending 31 Jan 58 on Contract Nonr-2133(00). 8 July 58, 46p. HEI Pub. no. M-577.
Order from LC mi$3.30, ph$7.80 PB 140 511

The primary objective of this study has been to determine practical methods for improving the reliability of digital systems through the use of redundant equipment. Among the several possibilities considered in the course of this study, the most promising was the majority principle. Under this principle, a redundant system S_r is constructed from a nonredundant system S_O by: (1) replacing each functional unit in S_O by a redundant set of $n = 2\mu - 1$ copies of the unit and (2) coupling the output terminal of each of the n copies to n input terminals of one, or more, majority gates (i.e., threshold μ elements). Since the state of the output terminal of a majority gate is the same as that possessed by μ, or more, of its input terminals, the majority gate acts as a restoring element (assuming that it is functioning properly) which corrects errors introduced by the failure of up to $\mu - 1$ copies of a replicated functional unit.

Institute of Mathematical Sciences, New York U., N. Y.
A GEOMETRIC ALGORITHM FOR SOLVING THE GENERAL LINEAR PROGRAMMING PROBLEM, by James K. Thurber. Rept. on Contract Nonr-285(32). June 58, 23p. IMM NYU-249.
Order from LC mi$2.70, ph$4.80 PB 140 344

The development of the subject of linear programming has centered to a large extent on the problem of maximizing (or minimizing) a linear form the variables of which are subject to linear inequalities or constraints. A method is proposed in this paper which is essentially a "gradient' procedure, and yet has the added feature of concluding in a finite number of steps. In some problems it works more "efficiently" than the simplex method as a consequence of the fact that instead of moving between neighboring vertices of the polyhedron of "feasible solutions" (as in the simplex method) it provides for moving across faces of this polyhedron.

Mellon Inst. of Industrial Research, U. of Pittsburgh, Pa.
COMPUTER COMPONENTS FELLOWSHIP NO. 347, by J. R. Bowman, W. J. Kirkpatrick and others. Quarterly rept. no. 11, second series, 1 Apr-30 June 56 on Contract AF 19(604)943. 24 Sep 56, 87p. 30 refs. AFCRC-TN-56-596; AD-98 801
Order from LC mi$4.80, ph$13.80 PB 136 725

A circuit layout was described in the last report in which connections to power supply and pulse source were on one edge and connections to active components and inductors were along the opposite edge. The preparation of stencils for printing these circuits has been completed. Aluminum and silver have been abandoned as materials for conductors because of the instability of aluminum in air at temperatures above 200°C and the tendency of silver to migrate at these temperatures. Satisfactory conductors of gold were prepared by both the screen process and vacuum-evaporation-deposition. Capacitors with lead borate glass and titanium dioxide loaded lead borate glass dielectrics were prepared by the screen process. An apparatus was constructed for flash-evaporation of resistor alloys in vacuo. Resistors prepared with this apparatus did not retain the composition of the feed alloy because of reaction with the filament. Resistors prepared by the screen process using boron carbide (B_4C) in a lead-borate flux were reproducible and stable to 260°C. This method is based on empirical equation in the literature. A list of papers and patents on stannic oxide films is included. The oven for high-temperature testing has been rewired. The copper electrical trim had corroded to an extent that it could no longer be used. Silver seems to be stable under the conditions necessary for testing these high-temperature circuits. Electroluminescent cells were prepared using glass with a conducting film (NESA) as front electrode, zinc sulfoselenide in polyvinyl chloride as electroluminophor and metals with work functions from 2.76 to 4.84 electron volts as back electrodes. The light output of the cell was greater for metals of higher work function except in the case of copper which gave unusually low light output.

Nevis Cyclotron Labs., Columbia U., Irvington-on-Hudson, N. Y.
USE OF AN IBM TO CALCULATE CLOUD CHAMBER EVENTS, by R. Bingham, D. Tycko, and L. Mc Dermott. Rept. on Contracts N6ori-110(01) and AT(30-1)1932. Nov 57, 28p. R-191; CU-154-57-ONR-110-Physics; Nevis-59.
Order from LC mi$2.70, ph$4.80 PB 136 711

Philco Corp., Philadelphia, Pa.
IMPROVED BINARY DIGITAL DATA-PROCESSING DEVICE, VOLUME II, by Emanuel Herscher. Final rept. for 1 Oct 56-26 Nov 57 on Contract AF 19(604)2032. 31 Dec 57, 59p. AFCRC TR-58-102; AD-146 885.
Order from LC mi$3.60, ph$9.30 PB 140 421

The purpose of this work was to design, develop, and deliver two improved binary digital data-processing devices--a pulse sequence sampler and a shift register--which use silicon transistors. Each device has been designed for operation both at the maximum reliable speed, and in ambient temperatures between room temperature and 130°C.

[Remington Rand Univac Div., Sperry Rand Corp.], St. Paul, Minn.
BIMONTHLY PROGRESS REPORT. Rept. no. 6, 1 July-31 Aug 47, on Contract N6onr-240, T. O. I. [1947] 73p.
Order from LC mi$4.50, ph$12.30 PB 140 169

Contents:
Summary of remarks made by Dr. Bramble at the Naval Ordnance Laboratory 17 July 1947
General specifications for bread-board models of a computer
An experimental investigation of selective alteration of digital data in magnetic recording storage systems
Note on the behavior of various digital-sequence patterns in a magnetic recording memory system using return-to-zero signals

Servomechanisms Lab., Mass. Inst. of Tech., Cambridge.
COINCIDENT-CURRENT MAGNETIC MEMORY UNIT, by William N. Papain. Doctoral thesis. Rept. on Project Whirlwind, Contract N5ori-060(01). 8 Sep 50, 87p. 8 refs. Rept. R-192; ATI-108 546.
Order from LC mi$4.80, ph$13.80 PB 140 843

A small, toroidal, ferromagnetic core whose B-H characteristic is properly "rectangular" in shape may be made to operate so that its flux polarity reverses only when the right combination of two or three magnetizing coils are coincidentally excited. The core may then be used as a coincident-current binary memory device which might be assembled, with many others, into a two- or three-dimensional memory system. Selection within such a system would be accomplished by means of physical-line switching along the two or three space coordinates.

Stanford Electronics Lab., Stanford U., Calif.
THE LINEAR LEAST SQUARES SYNTHESIS OF CONTINUOUS AND SAMPLED DATA MULTIVARIABLE SYSTEMS, by R. C. Amara. Technical rept. no. 40 on Contract Nonr-225(24). 28 July 58, 134p. 32 refs.
Order from LC mi$6.90, ph$21.30 PB 140 685

The class of systems treated in this report is that characterized by a multiplicity of inputs and outputs. For such linear multivariable systems subject to continuous and sampled stochastic inputs with arbitrary self- and cross-correlations a derivation is made of the minimization equations to be satisfied by the optimum transfer-function matrix. The criterion of performance which is used is the minimization of the sum of the mean-square errors between the set of actual outputs and a set of desired outputs. In each case the errors are evaluated at all instants of time.

Washington U., Seattle.
AN ITEM COMPARISON METHOD OF SCORING RATING SUB-SCALES ON THE IBM TYPE 650, by Chadwick Karr and Calvin E. Wright. Rept. on Contract Nonr-477(08). June 58, 7p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 140 178

In attempting to develop better predictors of performance, forced-choice personality inventories have been designed which match statements on some characteristic which is believed to influence item endorsement independent of the personality assessment being made. This program which scores rating scales uses the same input and output card forms, but produces scores which tend to correlate highly with the scores which would be obtained with a forced-choice inventory using the same statements. This program was also designed to produce sub-scale or trait scores, but not by the summation of ratings. This procedure may be used for scoring other kinds of data.

MECHANICS

Aeroelastic and Structures Research Lab., Mass. Inst of Tech., Cambridge.
ON CREEP BUCKLING OF COLUMNS AND PLATES, by T. H. H. Pian and R. L Johnson (Master's thesis). Rept. on Contract Nonr-1841(22). Nov 57, 31p. 3 refs Technical rept. 25-24.
Order from LC mi$3.00, ph$6.30 PB 136 767

Several applications of a general variational theorem for creep have been made. In the case of creep buckling of columns it is shown that the variational operation is simplified when the stresses are so distributed that the relation between bending moment and deflection is satisfied. The method is applied to an H-section column which is assumed to deform in the shape of a half sine wave as a series of sine waves. Results show that the inclusion of any higher order deflection modes does not introduce appreciable change in the critical creep buckling time. The method is also extended to creep buckling of a sandwich plate of rectangular planform uniformly compressed in one direction.

Brown U. Div. of Applied Mathematics, Providence, R. I.
DYNAMIC EFFECTS IN A "CONSTANT FORCE" FRICTION BRAKE, by K. L. Miller and E. H. Lee. Technical rept. no. 35 on Contract DA 19-020-ORD-798. July 58, 28p. 3 refs. Rept. DA-798/35.
Order from LC mi$2.70, ph$4.80 PB 140 203

A certain type of friction brake for a shaft in translatory motion in the direction of its axis is shown in Fig. 1a both in section and schematically. It consists of a sleeve or web surrounding the shaft and containing a large number of pairs of helical wires with opposite windings. It is the purpose of this study to determine the varying friction force of such a brake on a shaft which is put in motion from rest with a constant acceleration.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON A PROBLEM OF OPTIMAL DESIGN, by William Prager. Technical rept. no. 38 on Contract Nonr-562(10). July 58, 24p. 3 refs. C11-38.
Order from LC mi$2.70, ph$4.80 PB 140 551

This paper is concerned with the rational design of a reinforced disc that is subjected to given edge loads acting in its plane. The disc material is brittle in tension, rupturing at arbitrarily small tensile stresses, and rigid, perfectly plastic in compression. Wherever the maximum principal stress is tensile, the disc is reinforced by thin rods or cords of a rigid, perfectly plastic material that follow the lines of principal tensile stress. The layout of the reinforce-

ment, its variable cross section, and the variable thickness of the disc are to be designed to minimize either the weight or the cost of the materials going into the disc.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON SOME RECENT DEVELOPMENTS IN THE LINEAR THEORY OF ELASTICITY, by Eli Sternberg. Technical rept. no. 4 on Contract Nonr-562(25). July 58, 50p. 105 refs. Rept. 562(25)/4.
Order from LC mi$3.30, ph$7.80 PB 140 512

The investigations which have been discussed, or merely mentioned, belong to the equilibrium theory, and developments in the theory of vibrations and wave propagation have been excluded entirely. Further, elastostatics has been interpreted in its narrowest sense. Thus, nothing has been said about progress in the fields of thermo-elasticity, aero-elasticity, and elastic instability.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE EFFECT OF SHEAR ON PLASTIC DEFORMATION OF BEAMS UNDER TRANSVERSE IMPACT LOADING, by B. Karunes and E. T. Onat. Technical rept. no. 39 on Contract Nonr-562(10). July 56, 17p. 11 refs. C11-39.
Order from LC mi$2.40, ph$3.30 PB 140 552

The impact problem for a rigid-plastic beam is formulated by using an interaction curve relating shearing force and bending moment for fully plastic action, and allowing for shear and rotary inertia effects. Using a simplified interaction diagram, the problem of point-impact loading is solved for a special case. The analysis shows that the shear effects are of considerable importance when the parameter $u_o = 2Q_o \ell / M_o$ is less than 20 where Q_o and M_o are plastic carrying capacities of the cross-section for pure shear and bending respectively and 2ℓ is the length of the beam.

Brown U. Div. of Applied Mathematics, Providence, R. I.
PAPER FOR FIRST SYMPOSIUM OF NAVAL STRUCTURAL MECHANICS: PLASTICITY, by D. C. Drucker. Technical rept. no. 41 on Contract Nonr-562(10). July 58, 79p. 112 refs. Rept. no. C11-41.
Order from LC mi$4.50, ph$12.30 PB 140 204

A number of types of problems which have been solved or which are capable of solution will be discussed. Attention will be directed toward those applications now recognized as in the domain of structural mechanics. An effort will be made, however, to deal with broad principles and so avoid too restricted a point of view. It is almost impossible to judge in advance which aspects of basic research will be of later practical use. A unified point of view will be adopted, to the extent to which this now seems possible, by basing the development on a narrower and on an extended postulate or definition of stability of material or of geometry. Stress-strain relations and their permissible idealizations, uniqueness of solution, variational and extremum principles, the theorems of limit analysis and design, and buckling of structures all are made more understandable by this approach.

Brown U. Div. of Applied Mathematics, Providence, R. I.
VISCOELASTIC STRESS ANALYSIS, by E. H. Lee. Rept. on Contract Nonr-562(10). July 58, 53p. 52 refs. C11-42.
Order from LC mi$3.60, ph$9.30 PB 140 205

The need for the application of viscoelastic stress analysis in order to include the influence of time effects in material behaviour is pointed out, and features of the resulting variation of stress distributions which are in marked contrast to results of elastic analysis are detailed. It is shown that while many aspects of linear theory have been developed to enable technologically important stress analysis problems to be solved, further developments are needed for the complete solution of design problems on this basis. In particular, methods of accurate measurement of viscoelastic material properties for combined stresses are lacking.

Columbia U., New York.
EXTENSIONAL VIBRATIONS OF ELASTIC PLATES, by R. D. Mindlin and M. A. Medick. Technical rept. no. 28 on Contract Nonr-266(09); Interim rept. on Contract DA 36-039-sc-72831. Apr 58, 44p. 13 refs. CU-36-58-ONR-266 (09)-CE; CU-7-58-sc-72831-CE.
Order from LC mi$3.30, ph$7.80 PB 140 659

A system of approximate, two-dimensional equations of extensional motion of isotropic, elastic plates is derived. The equations take into account the coupling between extensional, symmetric thickness-stretch and symmetric thickness-shear modes and also include two face-shear modes. The spectrum of frequencies for real, imaginary and complex wave-numbers in an infinite plate is explored in detail and compared with the corresponding solution of the three-dimensional equations.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDIES AND INVESTIGATIONS OF AGGLOMERATION AND DEAGGLOMERATION OF SOLID PARTICLES, by Clyde Orr, Jr. and J. M. Dallavalle. Semi-final rept. 30 June 56, 98p. 56 refs.
Order from LC mi$5.40, ph$15.30 PB 140 304

A theoretical and experimental study has been conducted of (1) the forces binding one particle of a powder to another; (2) the effects on the binding forces of various factors, such as chemical composition, adsorbed compounds and humidity; and (3) deagglomerating mechanisms, including the forces developed and other characteristics. Deagglomeration of airborne agglomerates upon passage through tubes of various dimensions at several flow rates has been investigated extensively.

Illinois U. Engineering Experiment Station, Urbana.
COMPRESSIBLE TWO-DIMENSIONAL JET MIXING AT CONSTANT PRESSURE: TABLES OF AUXILIARY FUNCTIONS FOR FULLY DEVELOPED MIXING PROFILES, by H. H. Korst, R. H. Page, and M. E. Childs. Rept. on Transonic and Supersonic Flow of a Real Fluid at Abrupt Increases in Cross Section, Contract AF 18(600)392. Apr 55, 72p. 2 refs. ME Technical note 392-3; AD-61 678.
Order from LC mi$4.50, ph$12.30 PB 140 385

This investigation yielded a theory for the turbulent compressible jet mixing which provided a solution for the velocity profiles in the jet mixing region. It was found that an asymptotic solution, corresponding to a fully developed velocity profile in the jet boundary, was reached when the length of the mixing region was long as compared with the initial thickness of the mixing region. These integrals have been evaluated by a digital computer (Illiac) for 21 values of the parameter Cza and are here presented in tabular form.

Institute of Mathematical Sciences, New York U., N. Y.
MEASURE-THEORETIC FOUNDATIONS OF STATISTICAL MECHANICS, by Robert M. Lewis. Rept. on Contract AF 49(638)341. Apr 59, 48p. 6 refs. Research rept. no. HT-2; AFOSR-TN-59-307; AD-213 091.
Order from LC mi$3.30, ph$7.80 PB 140 588

The basic formulas of classical equilibrium statistical mechanics are derived from well-known theorems in measure theory and ergodic theory. The method used is a generalization of the methods of Khinchin and Grad and deals with several, in fact a "complete set," of "invariants" or "integrals of the motion." Most of the results are simple corollaries of Birkhoff's ergodic theorem, and since time-averages are used, the whole approach is characterized by an absence of statistical "ensembles" and probability notions. In the course of the development a "generalized temperature" is introduced, and a generalization of the second law of thermodynamics is derived. Formulas for the "microcanonical," "canonical", and "grand canonical" distributions appear as special cases of the general the theory.

Institute of Mathematical Sciences, New York U., N. Y.
PROPAGATION OF WEAK HYDROMAGNETIC DISCONTINUITIES, by Jack Bazer and Owen Fleischman. Rept. on Contract AF 19(604)2138. Mar 59, 51p. 13 refs. Research rept. no. MH-10; AFCRC TN-59-255; AD-212 264.
Order from LC mi$3.60, ph$9.30 PB 140 636

A theoretical discussion is given of the propagation of weak hydromagnetic discontinuities (e.g., weak shocks) in an infinitely conducting, perfect, compressible fluid. The undisturbed flow is assumed to be steady and isentropic. It is shown that, in general, six wave fronts will evolve from a given initial manifold. As in geometrical optics, these wave fronts are constructed by means of rays. In addition, formulas are derived, describing the variation of the discontinuity "strength" of a given propagating mode along rays associated with that mode. In the special case where the undisturbed state is homogeneous, simple explicit formulas are given for the wave fronts evolving from an arbitrary initial manifold and for the strength of the disturbance on these fronts. These results are employed to solve a mixed initial boundary-value problem that has been designed to illustrate (i) a method of producing hydromagnetic disturbances and (ii) the fact that an initial disturbance gives rise, in general, to several propagating waves.

North American Aviation, Inc., Columbus, Ohio.
DOD HIGH STRENGTH TITANIUM ALLOY SHEET RESEARCH PROGRAM, by A. Federico. Progress rept. no. 6, 1 Oct-31 Dec 58, on Contract NOas 57-785d. 31 Jan 59, 99p. 2 refs. Rept. no. NA57H-527-6.
Order from LC mi$5.40, ph$15.30 PB 140 275

Fabricability tests have been conducted on sheets of 16V-2 1/2Al. These tests indicate formability comparable to currently used AMS 4908 (8% Mn) material. Because of a relaxation phenomenon shown in 16V-2 1/2Al upon application of heat to formed parts, extensive jigging during aging may be necessary. Dimpling of fully aged 16V-2 1/2Al is difficult. Spot welding of 4Al-3Mo-1V is promising and shows better elevated temperature stability than previously tested 16V-2 1/2Al.

Pennsylvania State U., University Park.
THE SOURCE-WAVE FOR A CONCENTRATED LOAD AT A PLANE BOUNDARY, by Norman Davids. Interim technical rept. no. 16 on Theoretical Analysis of Scabbing in Materials, Contract DA 36-061-ORD-465. 31 Dec 58, 31p. 5 refs. AD-210 756.
Order from LC mi$3.00, ph$6.30 PB 140 670

The general solution to the equations of stress waves as given in spherical coordinates is classified, by means of a parameter n appearing in this solution, into waves of positive and negative integer orders. The expressions for the displacements and stresses are given for orders zero, one, and minus one, and the results applied to a study of the stresses developed in a hemispherically-shaped region very close to a point of concentrated impact on a plane surface of a solid or plate. The wave of order minus one is a singular wave developed for the purpose of making the boundary stresses vanish at the source. The distribution of normal and shearing stresses on this plane are plotted for a typical aluminum material, and from this, the zone of validity of the solution is estimated.

Technische Hochschule, Hannover (Germany).
THIN-WALLED COMPRESSION MEMBERS, by A. Pfluger. Rept. no. 1 on Contract AF 61(514)1140. Dec 58, 38p. 13 refs. AFOSR TN-59-291; AD-212 923
Order from LC mi$3.00, ph$6.30 PB 140 693

Development of mathematical formulae for the buckling of thin wall sections of various shapes.

University Coll., Cork (Eire).
TORSION OF SEMI-ELLIPTIC AND HOLLOW-ELLIPTIC SECTIONS, by Patrick M. Quinlan. Technical note no. 4 on Contract AF 61(514)1163. July 58, 25p. 6 refs. AFOSR TN-58-883; AD-203 905.
Order from LC mi$2.70, ph$4.80 PB 136 739

Conformal mapping is used to reduce the torsion problem for hollow-elliptic and semi-elliptic sections to a potential problem in a rectangle. In each case both the appropriate stress function and the torsional rigidity are obtained in series form, and the appropriate asymptotic form of the series for the stress components is given for use where greater precision is required. Solutions developed for the hollow elliptic tube and the prolate semi-elliptic shaft check with existing solutions obtained by other methods. Solutions are also given when the above sections are cracked; the crack in each case being along the major axis extending respectively through the thickness of the tube, and to the focus of the shaft. The torsion of an oblate semi-elliptic shaft is also included. Calculations were performed to evaluate the effects of cracking on the sections, and the results are presented in tabular form.

Vibration Research Lab., Stanford U., Calif.
COMPARATIVE STUDY OF PULSE AND STEP-TYPE LOADS ON A SIMPLE VIBRATORY SYSTEM, by Lydik S. Jacobsen and Robert S. Ayre. Technical rept. no. 16 on Structural Dynamics, Contract N6ori-154(01). 25 Jan 52, 83p. 6 refs. ATI-139 914.
Order from LC mi$4.80, ph$13.80 PB 140 842

The response of a simple vibratory system to a wide variety of pulse and step-type loadings has been shown in terms of displacement and time and in terms of the maximum-response spectra ("maximax" displacement, "maximax" distortion, and residual amplitude, versus pulse-duration or step-rise-time). The main purpose is to provide a graphical comparison of the responses; many of the details will of course be found in various sources in the electrical-transient, as well as in the mechanical-transient, literature. Specific application has been made to the following types of excitation: force, ground displacement, and ground excitation.

Aerodynamics and Pneumatics

Aero-Space Labs., North American Aviation, Inc.
EFFECT OF CONTROLLED THREE-DIMENSIONAL ROUGHNESS ON BOUNDARY LAYER TRANSITION AT SUPERSONIC SPEEDS, by E. R. van Driest and W. D. McCauley. Rept. on Contract AF 49(638)250. Nov 58, 51p. 5 refs. MD59-115; AFOSR TN-58-176; AD-152 209.
Order from LC mi$3.60, ph$9.30 PB 140 424

Experiments were performed in the 12-inch supersonic wind tunnel of the Jet Propulsion Laboratory of Caltech to investigate the effect of three-dimensional roughness elements (spheres) on boundary-layer transition on a 10 degree (apex angle) cone with zero heat transfer. Data were obtained at local Mach numbers of 1.90, 2.71, and 3.67 by varying trip size, position, spacing, and Reynolds number per inch.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
FLUTTER OF LOW-ASPECT RATIO WINGS. PART I. CALCULATION OF PRESSURE DISTRIBUTIONS FOR OSCILLATING WINGS OF ARBITRARY PLANFORM IN SUBSONIC FLOW BY THE KERNEL-FUNCTION METHOD, by Pao-Tan Hsu. Rept. on Contract NOas-55-771-c. Oct 57, 84p. 16 refs. Technical rept. 64-1.
Order from LC mi$4.80, ph$13.80 PB 139 207

Based on a numerical solution of the pressure-downwash integral equation, an improved method of calculating the pressure distribution on an oscillating wing of arbitrary plan form in subsonic flow was developed. Over the planform a continuous pressure distribution which satisfied the boundary conditions at the edges was first assumed. The coefficients of each terms in the pressure series were to be evaluated by a downwash collocation method at a set of preferred stations on the planform. Using these collocation stations, maximum possible accuracies in the lift, moment, etc. were obtainable for a given number of stations.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
FLUTTER OF LOW-ASPECT-RATIO WINGS. PART II. AEROELASTIC MODEL DESIGN AND TESTING, by M. M. Chen. Rept. on Contract NOas-55-771-c. Oct. 57, 113p. 16 refs. Technical rept. 64-2.
Order from LC mi$6.00, ph$18.30 PB 139 245

Structural simulation in the design of aeroelastic models can be based on wing data in terms of influence coefficients or the distribution of stiffness parameters. The design of a doubly-flexible model of a low-aspect-ratio wing has previously been shown to be very difficult and cumbersome when based on influence coefficients. It is demonstrated in this report that the design of such a model when based directly on stiffness distributions and the analogy to an aeolotropic plate is both straightforward and successful. An improved technique of designing beam-like models from influence coefficient data is also presented. (See also PB 139 207)

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE APPLICATION OF ANALOG COMPUTERS TO VARIOUS COMBUSTION, FLAME, AND FLUID DYNAMICS PROBLEMS, by Theodore J. Williams. June 58, 64p. 25 refs. WADC Technical note 58-171; AD-207 528.
Order from OTS $1.75 PB 151 775

Problems considered here include: the solution of the equations of the steady state laminar flame; the unsteady state laminar flame; flame phenomena in turbulent flow; the problem of simulating the steady state detonation wave; and the status of the investigation of oscillations in a rocket motor. A description of the method of attack for each problem on the analog computer is given along with an estimate of the required computer equipment where possible. Finally, a listing of possible topics for investigation and a comparison of results possible with an analog computer as compared

to those obtainable with other presently available methods of solution is included.

Air Force Missile Development Center, Holloman AFB, N. Mex.
DEVELOPMENT OF MONORAIL SLEDS ON THE HOLLOMAN TRACK FROM JANUARY THROUGH JUNE 1958, by Peter L. Mullins and Heinz T. Schwinge. Mar 59, 101p. 4 refs. AFMDC TN-59-3; AD-210 009.
Order from LC mi$5.70, ph$16.80 PB 140 540

Track vehicles which use only one of the two rails of a high-speed track have many technical advantages over conventional dual-rail sleds. They are simpler, more economical, and capable of higher performance. During the first half of 1958, 41 tests were made in which vehicle velocity was increased from 1500 to over 4000 ft/sec, instruments for vibration measurement were carried to over 3000 ft/sec, and efficient, reliable braking systems were developed. With continuing development, monorail sleds can be built to carry payloads of 2000 pounds up to 2000 ft/sec or 300 pounds payload into the Mach 6 region.

Arnold Engineering Development Center, Tullahoma, Tenn.
TESTS IN THE PWT 16-FT TRANSONIC CIRCUIT OF AN AGARD MODEL B AND A MODIFIED MODEL C AT 1.15-PERCENT BLOCKAGE, by R. S. Dick. Rept. on Contract AF 40(600)700. Apr 59, 34p. 4 refs. AEDC-TN-59-32; AD-214 200.
Order from LC mi$3.00, ph$6.30 PB 140 538

Lift, drag, and pitching moment characteristics of the AGARD Model B and a modified AGARD Model C were obtained at the AEDC in the 16-Ft Transonic Circuit of the Propulsion Wind Tunnel Facility. The Mach number was varied from 0.70 to 1.60 and the angle of attack from -4 to+9 degrees. The models represented 1.15-percent blockage. The Reynolds number based on the wing mean aerodynamic chord was approximately 10×10^6.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECT OF SOLID SUSPENSIONS ON GAS FLOW, by R. C. Makino and H. N. Brown. Jan 58, 61p. 13 refs. Memo rept. no. 1123.
Order from LC mi$3.90, ph$10.80 PB 140 298

The equations governing the properties of a mixture of compressible fluid and suspension of spherical solid particles are analyzed to study the effect of heat and momentum exchange between the fluid and the suspension on the fluid flow. The general transport equations, where the fluid is regarded as a continuum and the particles are regarded statistically, are examined, and sufficient assumptions on thermal and dynamic equilibrium are made to obtain the macroscopic equations of fluid flow and solid particle motion. The special case of plane gas flow is treated in further detail.

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
INTERFEROMETRIC MEASUREMENT OF THE RATE OF DISSOCIATION OF OXYGEN HEATED BY STRONG SHOCK WAVES, by Stanley Richard Byron. Rept. on Contract Nonr-401(25). [1958] 108p. 18 refs.
Order from LC mi$5.70, ph$16.80 PB 140 571

A long duration spark interferometer and shock tube were constructed with which accurate measurements could be made of the density as a function of time behind shock waves. The properteis of the gas can be determined from this measurement and a measurement of the shock speed provided 1) the flow is steady in shock fixed coordinates and 2) a relation between the temperature of the gas and its pressure or enthalpy is available. Chemical kinetic studies can then be made with this instrument. Measurements of the vibration relaxation time in oxygen and nitrogen were made and agreed with Blackman's measurements. Dissociation of oxygen was studied in various mixtures of oxygen and argon. By comparing the measured vibration relaxation times with the measured dissociation times in oxygen it was shown that they will be ordered first and second respectively over the range of temperature and density of interest to aerodynamicists. Studies of nitrogen vibration and oxygen dissociation in air were also made.

Hiller Helicopters, Palo Alto, Calif.
APPLICATION OF CIRCULATION CONTROL TO HELICOPTER ROTORS, by R. N. Greenman and M. G. Gaffney. Rept. on Contract Nonr-2197(00). 9 Nov 57, 90p. 63 refs. Rept. no. ARD 158.
Order from LC mi$4.80, ph$13.80 PB 136 749

A theoretical analysis is carried out in order to investigate the aerodynamic potentialities of a helicopter rotor equipped with jet flap circulation control. Equations are developed for the air flow pumped through the rotor blades, and the results of French two-dimensional studies on the jet flap are used to calculate the performance of the helicopter rotor system. Calculations are made of the hovering efficiency and forward flight performance of the jet flap rotor and comparisons are made with a conventional rotor of the same dimensions. As this priminary study is primarily concerned with aerodynamic efficiencies, no attempt has been made to estimate the changes in weight due to the jet flap system.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE ELECTRIC SPARK METHOD FOR QUANTITATIVE MEASUREMENTS IN FLOWING GASES, by H. J. Bomelburg, J. Herzog and J. R. Weske. Rept. on Contract AF 49(638)385. Jan 59, 32p. 11 refs. Technical note BN-157; AFOSR TN-59-273; AD-212 707.
Order from LC mi$3.00, ph$6.30 PB 140 222

The operating principle of the technique and the required instrumentation are described. Characteristics of spark discharges are analyzed theoretically and experimentally. A calibration is established for quantitative evaluation of spark photographs. Examples of application are given for subsonic, transonic, and supersonic flow and for investigations of turbomachines.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
EXPERIMENT ON TURBULENT SHEAR FLOWS IN SMOOTH TWO-DIMENSIONAL TUNNELS, by Matthew Stevenson. Progress rept. no. 1 on Effect of Surface Roughness on Turbulent Shear Flows, Contract Nonr-595(07). July 58, 27p. 10 refs. Technical note BN-147.
Order from LC mi$2.70, ph$4.80 PB 140 474

Results are presented in the form of the non-dimensional inner logarithmic wall law for turbulent shear flow through two-dimensional smooth wind tunnels. The local resistance law is established by direct experimental measurement and from velocity distributions. The experiment is carried out using two wind tunnels of different aspect ratios, the results from each providing the same statement of the smooth laws. Comparison of these results with those of other similar investigations is made. A further development of Preston's surface-tube method for determining wall shearing stress is shown to be superior to the usual static pressure gradient method.

Institute of Engineering Research, U. of California, Berkeley.
A FLOATING ELEMENT WIND TUNNEL BALANCE, by William F. Schick. Rept. on Contract Nonr-222(45). 15 July 58, 31p. 12 refs. Technical rept. HE-150-159; Series no. 20, issue no. 121.
Order from LC mi$3.00, ph$6.30 PB 140 584

This report describes a single component microbalance designed expressly for measuring localized drag near the leading edge of a flat plate surface. The balance is to be used in the Low Pressures Project Wind Tunnel Number Four at the Richmond Field Station of the University of California. Sensitivity of the present balance is 0.1 milligram and the maximum range is greater than one gram. The sensitivity can be increased by increasing the weight of the floating element support. Balance design is based on a null system utilizing two sets of flexure pivots for model support and force measurement. There are no knife edges, rolling or sliding contact surfaces, or other devices with frictional inaccuracies used in the primary balance system.

Institute of Engineering Research, U. of California, Berkeley.
FLOW VISUALIZATION USING AIR AFTERGLOW EXCITED BY A CROSS STREAM 60 CYCLE DISCHARGE, by W. B. Kunkel. Technical rept. on Contract AF 33(038)8896. 26 Aug 52, 18p. 5 refs. Rept. no. HE-150-107; Series no. 23, issue no. 8; AD-36 591.
Order from LC mi$2.40, ph$3.30 PB 136 039

A powerful 60 cycle cross stream glow discharge between water cooled Kovar electrodes was used to excite reproducible afterglow in air. The afterglow intensity in a low density supersonic stream was such that good shockwave photographs could be obtained with exposure times of the order of one minute. Excessive heating of all metal surfaces exposed to the active gas, however, prevented the use of pressure probes to determine the flow properties of the glowing stream. If pulsed operation and cooling of probes and models are applied the method is considered useable. Since the glow characteristics are not yet known, quantitative interpretation of the photographs is not yet possible.

Institute of Engineering Research, U. of California, Berkeley.
PRESSURE DISTRIBUTIONS ON FLAT PLATES AT MACH 4 AND LOW DENSITY FLOW, by Jerome Aroesty. Rept. on Contract Nonr-222(45). 28 July 58, 55p. 23 refs. Technical rept. HE-150-157; Series no. 20, issue no. 120.
Order from LC mi$3.60, ph$9.30 PB 140 585

Induced pressures on sharp leading edge flat plates in a supersonic low density air stream were measured over the range $29.7 < Re_x < 4101$ and $3.7 < M < 4.1$. The Reynolds number corresponding to the leading edge thickness was less than 85, insuring that blunt leading edge effects were negligible, as shown by an earlier study in the Berkeley Low Density Wind Tunnel. The measured pressure distributions agree with the analysis of Kuo to a value of $\chi = 2.5$, and agree with the modified tangent wedge theory described in Appendix A to a value of $\chi = 3.5$. Beyond a value of χ of 4, the pressures are less than those predicted by the theories, and essentially reach a constant value of $p/p_\infty = 3.5$ as the leading edge is approached. This reduction in the pressures from the levels predicted by boundary layer theory indicates a possibility of slip effects near the leading edge.

Institute of Tech., U. of Minnesota, Minneapolis.
AIRFOIL IN A SONIC SHEAR FLOW JET. A MIXED BOUNDARY VALUE PROBLEM FOR THE GENERALIZED TRICOMI EQUATION, by Chieh C. Chang and Thomas S. Lundgren. Rept. on Contract AF 18(600)1456. May 56, 36p. 11 refs. Aeronautical research rept. no. 1; AFOSR TN-58-521; AD-158 334.
Order from LC mi$3.00, ph$6.30 PB 140 456

Small perturbations of a non-uniform two-dimensional flow of a compressible inviscid fluid are considered. It is shown that for a particular class of main stream Mach number distributions, which are characterized by a sonic line along x-axis, the linearized shear flow equation may be transformed into the generalized Tricomi equation. The mixed boundary value problem which results from considering perturbations generated by a two-dimensional camber surface is formulated and solved by utilizing the Wiener-Hopf technique.

Laboratoire Méditerraneen de Recherches Thermodynamiques (France).
CONSTRUCTION AND CALIBRATION OF A LOW DENSITY WIND TUNNEL, by F. Marcel Devienne, G. M. Forestier, and A. F. Roustan. Technical note on Contract AF 61(514)1126. Jan 58, 58p. 23 refs. AFOSR TN-58-212; AD-154 113.
Order from LC mi$3.60, ph$9.30 PB 140 455

A description is given of a low wind tunnel whose static pressure in the test chamber may, during the

flow, vary between 1/10 micron and a few microns of mercury. The pumping in this wind tunnel is principally ensured by four large three-stage vacuum pumps. In order to calibrate the wind tunnel a preliminary study of the measurement of the impact pressure and of the corrections required by this measurement, is carried out with different pressure probes and for very different diameters. The results obtained after correction of the pressures lead us to admit that for a given nozzle and a static pressure in the range of 0.67 micron, the ratio of the impact pressure to the static pressure is given by the Superaerodynamic formula. The application of this formula leads us to the conclusion that the Mach number on the axis is very close to 4. The study of the field of pressure enables us to show that the velocity is fairly constant in the neighbourhood of the axis in a cylinder having a diameter of approximately one third of that of the nozzle.

Laboratoire Méditerranéen de Recherches Thermodynamiques (France).
REVOLVING ARM METHOD AND ITS APPLICATION TO RAREFIED GAS DYNAMICS AND AERO-THERMODYNAMICS, by F. Marcel Devienne. Technical note on Contract AF 61(514)1126. May 58, 22p. 4 refs. AFOSR-TN-58-769; AD-201 866.
Order from LC mi$2.70, ph$4.80 PB 136 872

After having brought to mind the principle of the revolving arm method device, and the possibilities of measuring the stagnation temperature and the total pressure, the advantages and disadvantages of this method are discussed. The essential advantage of the revolving arm method is that the experimental conditions are perfectly determined. The revolving arm method is however limited by the fact that it is impossible to reach extremely high speeds. In the free molecular flow regime or the transition flow regime the revolving arm method can be applied without correction for Knudsen number values superior or equal to 0.6 in the case of dry air. At higher pressures, which correspond to lower Knudsen numbers, it is necessary to make some corrections in order to keep account of the heating of gaseous layers in the vicinity of the arm.

Massachusetts Inst. of Tech., Cambridge.
REVIEW OF UNSTEADY AERODYNAMIC STUDIES IN THE FLUID DYNAMICS RESEARCH GROUP, 1955-1958, by Haim Kennet and Holt Ashley. Rept. for Mar 55 - Mar 58 on Contract AF 18(600)961. Dec 58, 57p. 27 refs. Fluid Dynamics Research Group rept. no. 58-5; OSR Technical rept. no. 59-6; AD-208 981.
Order from LC mi$3.60, ph$9.30 PB 140 000

The configurations investigated include wings, bodies and wing body combinations. The speed regimes considered were transonic, supersonic and hypersonic. In transonic and supersonic flows the method developed is an extension of an iterative technique originally proposed by Adams and Sears. It estimates aerodynamic loads on slender symmetrical configurations performing small lateral oscillations. The reduced frequencies involved are also small. Planar surfaces in unsteady supersonic flow are treated in two fashions. For wings with subsonic leading edges and supersonic trailing edges, strip theory is applied. For thin wings at high Mach number M the perturbation velocity potential is expanded in a series of M^{-2}. Only first and second-order terms in the perturbation velocities are taken into account; the first term for the pressure agrees with so-called piston theory. Additional terms provide improved accuracy for moderately high M.

Polytechnic Inst. of Brooklyn, N. Y.
ANALYSIS OF THE LAMINAR COMPRESSIBLE BOUNDARY LAYER CHARACTERISTICS OVER AN ISOTHERMAL FLAT PLATE WITH FINS, by Adrian Pallone. Rept. on Contract AF 49(638)217. Feb 59, 67p. 10 refs. PIBAL rept. no. 468; AFOSR TN-59-275; AD-212 709.
Order from LC mi$3.90, ph$10.80 PB 140 459

This paper presents a theoretical investigation of the compressible laminar boundary layer characteristics of a flow over an isothermal flat plate with fins. In order to simplify the problem mathematically and yet retain its salient physical features, the equations are reduced to a two-dimensional form by replacing the variation of all quantities in the direction normal to the plane of the fins by average values. The resulting equation is then integrated for various free stream Mach numbers, fin characteristics and wall to free stream temperature ratios. The results are presented in general form and are qualitatively discussed. A specific example of practical interest is also presented.

Polytechnic Inst. of Brooklyn, N. Y.
NATURAL FREQUENCIES OF AN INFINITELY LONG NONCIRCULAR CYLINDRICAL SHELL, by Jerome M. Klosner and Frederick V. Pohle. Rept. on Contract Nonr-839(17). July 58, 27p. 20 refs. PIBAL rept. no. 476.
Order from LC mi$2.70, ph$4.80 PB 140 556

The natural vibration frequencies for an infinitely long noncircular cylindrical shell are determined for the condition of plane strain. The noncircular shell is formed so that it has the same circumference as a circular shell of radius r_o; it is assumed that the radius of curvature of the shell is given by $r = r_o/(1$ cos 2S) where the parameter ε is a measure of the noncircularity of the shell. A perturbation technique is used to determine the frequencies as a function of and only terms of $O(\varepsilon^2)$ are retained. The technique is valid for $\varepsilon < 1$, that is, for a ratio of major to minor axis of 2.06.

Polytechnic Inst. of Brooklyn, N. Y.
ON THE DIFFRACTION OF AN ARBITRARY PULSE BY A WEDGE OR A CONE, by Lu Ting. Rept. on Contract AF 49(638)445. Feb 59, 14p. 5 refs. PIBAL rept. no. 502; AFOSR TN-59-127; AD-210615.
Order from LC mi$2.40, ph$3.30 PB 140 643

By virtue of Green's Theorem, it is shown that for the diffraction of an arbitrary two-dimensional incident pulse by a wedge of angle μ, the ratio of the resultant velocity potential to the corresponding value of the incident pulse at the corner of the wedge at any instant is equal to $2\pi/(2\pi-\mu)$; and that for the

diffraction of a three-dimensional pulse by a cone of solid angle ω, the ratio at the vertex of the cone is equal to $4\pi/(4\pi-\omega)$.

Rensselaer Polytechnic Inst., Troy, N. Y.
INVISCID FLOW AROUND A BLUNT BODY OF A REACTING MIXTURE OF GASES. PART B. NUMERICAL SOLUTIONS, by W. Lick. Rept. on Contract AF 18(600)1591. Dec 58, 79p. 9 refs. TR AE5814; AFOSR TN-58-1124; AD-207 833.
Order from LC mi$4.50, ph$12.30 PB 140 581

To determine the effects of chemical non-equilibrium on the flow about a blunt body, a detailed analysis of the flow field is necessary. The present paper describes an inverse method for the computation of the subsonic shock layer region. Results for three examples for the flow of air and one for the flow of pure oxygen through a prescribed shock shape at a Mach number of 14 and for free stream density and temperature corresponding to those at 100,000 ft. altitude are presented. (See also PB 136 214)

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
THE APPLICATION OF CONSTANT PROPERTY SOLUTIONS TO MASS TRANSFER COOLING CALCULATIONS, by C. J. Scott. Rept. on Contract AF 18(600)1226. Dec 58, 52p. 36 refs. Engineering memo. no. 76; AFOSR TN-59-201; AD-211 527.
Order from LC mi$3.60, ph$9.30 PB 140 425

Simple transformation relations are developed for applying the results of constant property laminar and turbulent boundary layer solutions to the calculation of mass transfer cooling problems using foreign gas effusion. A reference concentration of four-tenths of the wall concentration was used in evaluating the properties. Comparisons are made with currently available exact theoretical solutions.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
ON THE AERODYNAMIC INSTABILITY OF SUPERSONIC INLET-DIFFUSERS, by C. C. Chang and C. T. Hsu. Rept. on Contract AF 18(600)1553. Jan 59, 45p. 17 refs. Research rept. no. 155; AFOSR TN-58-887; AD-152 099.
Order from LC mi$3.30, ph$7.80 PB 140 547

The stability problem of the supersonic inlet-diffuser is first reduced to find the acoustic impedance at the inlet of the plenum chamber. The inlet acoustic impedance is then obtained by solving the linearized viscous compressible flow equations in the entire subsonic diffusion regimes. The above solutions satisfy Burger's boundary conditions behind the oscillating shock. Essential assumptions of one-dimensional quasi-steady flow and linear velocity distribution are used.

Technische Hochschule, Munich (West Germany)
EXAMPLE FOR THE PRACTICAL CALCULATION OF SUPERSONIC FLOW FIELDS PAST OSCILLATING BODIES OF REVOLUTION BY A METHOD DUE TO SAUER, by Johann Muench. Technical note no. 5 on Contract AF 61(514)1080. 4 Aug 58, 15p. 1 ref. AFOSR TN-58-881; AD-203 907.
Order from LC mi$2.40, ph$3.30 PB 136 740

Technische Hochschule, Karlsruhe (West Germany)
RING AIRFOIL THEORY: PROBLEMS OF INTERFERENCE AND BOUNDARY LAYER, by Johannes Weissinger. Rept. on Contract AF 61(514)1207. Jan 59, 108p. 19 refs. AFOSR TN-59-226; AD-211 809.
Order from LC mi$5.70, ph$16.80 PB 140 694

The investigations of the preceding report have been continued. As a new subject the interference of the ring with a strut (of small chord length) is studied. The theory of ring body interference is extended to (slender) bodies of finite length whose diameter is small compared with the ring diameter. In this report also the shape parameter L/D is assumed to be small. The lift of the body and of the wing as well as the pitching moment of the body have been determined; explicit formulas and numerical results are given for ellipsoids of revolution.

Training Center for Experimental Aerodynamics (Belgium).
EXPERIMENTAL EVIDENCE OF THREE-DIMENSIONAL PERTURBATIONS IN THE REATTACHMENT OF A TWO-DIMENSIONAL LAMINAR BOUNDARY LAYER AT M-205, by Jean Ginoux. Rept. on Contract AF 61(514)993. Nov 58, 35p. 12 refs. TCEA Technical note. no. 1; AFOSR TN-59-169; AD-211 148.
Order from LC mi$3.00, ph$6.30 PB 140 235

The reattachment of a laminar boundary-layer after separation has been investigated at a Mach number of 2.05. Backward facing step models were used that completely spanned the working section. Surface flow was observed by a sublimation technique and detailed span-wise surveys were made in the reattachment region of the flow with total head probes. Strong, regular and repeatable span-wise perturbations were observed which could not be explained by irregularities either in the airflow upstream of the models or in the models themselves.

Watertown Arsenal Labs., Mass.
BUCKLING CHARACTERISTICS OF CIRCUMFERENTIALLY REINFORCED THIN CYLINDRICAL SHELLS SUBJECTED TO AXIAL COMPRESSION AND INTERNAL PRESSURE, by Jerome J. Connor, Jr. Rept. on Stress Analysis Studies for the "Jupiter" Project. Aug 58, 32p. 9 refs. WAL Technical rept. 715/2.
Order from LC mi$3.00, ph$6.30 PB 140 583

An experimental study employing aluminum modeld was conducted to evaluate the possible modification in buckling characteristics resulting from the addition of integral circumferential stiffeners. This initial phase was limited to a particular ribbed configuration suggested by ABMA and the models were subjected to internal pressure as well as axial compression. Emphasis was placed on whether the location of the

ribbing (internal or external) influenced the strength appreciably and also on how the critical stress for the milled cylinders compared with that of the unmilled cylinders having the same nominal thickness.

Hydrodynamics, Hydraulics, and Hydrostatics

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SCATTERING OF SURFACE WAVES ON AN INFINITELY DEEP FLUID, by James Edward Burke. Technical rept. no. 76 on Contract Nonr-225(11). 5 Aug 58, 67p. 15 refs.
Order from LC mi$3.90, ph$10.80 PB 140 793

California U., Los Angeles.
RADIATION-INDUCED CAVITATION, by David V. Lieberman. Doctoral thesis. Technical rept. no. 12 on Contract Nonr-233(48). July 58, 147p. 39 refs.
Order from LC mi$7.20, ph$22.80 PB 140 786

Acoustic cavitation can be nucleated by ionizing radiation. The cavitation threshold in pentane irradiated by fast neutrons is associated with nucleation caused by recoil carbon nuclei. Recoil protons do not nucleate cavitation in pentane at acoustic amplitudes below 10 bars. The threshold in acetone is probably determined by recoil carbon nuclei, and possibly also, recoil oxygen nuclei. The measured thresholds are within the range predicted by Seitz's theory. However, the theory in its present form is too approximate, and information regarding the rate of energy loss of slow charged particles passing through matter is too scanty, to allow definite conclusions to be drawn. The spherical resonator in the form used in these experiments is difficult to work with. However, with further development it might become a convenient and versatile instrument in cavitation research.

Colorado State U., Fort Collins.
USE OF A CAPACITANCE INFLUENCE PROBE FOR MEASURING WAVE PROFILES, by J. B. Phillips and B. F. Schulz. Rept. on Contract Nonr-1610(03). [1958] 15p. 1 ref. CER58EFS3.
Order from LC mi$2.40, ph$3.30 PB 140 151

This report describes the features of electronic instrumentation for measuring and recording the wave amplitudes and configurations of water waves. The gaging element of this system consists of a small flat metal plate suspended above the surface of the water. This plate acts as one plate of a capacitor and the surface of the water acts as the other plate. The dielectric of this capacitor is the air space between the water and the probe plate. This report includes schematic and block diagrams of the instrument and data gathered in the process of design and development of the various component parts.

Colorado U., Boulder.
ANISOTROPIC PROPERTIES OF STRAINED VISCOELASTIC FLUIDS. I. A METHOD FOR MEASURING STRAIN BIREFRINGENCE, by Stanley J. Gill. Rept. on Contract AF 49(638)310. 22 Aug 58, 20p. AFOSR TN-58-762; AD-201 861.
Order from LC mi$2.40, ph$3.30 PB 136 752

A new method is described for producing a temporary anisotropic state in viscous polymer solutions. Attention was directed towards a measurement which would yield some information about the state of molecular strain. It also seemed desirable to consider a method capable of producing relatively large strains.

METALLURGY

Massachusetts Inst. of Tech., Cambridge, Mass.
PERIODIC STATUS REPORT NO. 24, by R. Pelloux, L. Rubin and others. Rept. for 1 May-31 July 58 on Contract Nonr-1841(28). [1958] 8p.
Order from LC mi$1.80, ph$1.80 PB 140 626

Contents:
Solute strengthening of nickel alloys at elevated temperatures
Fine slip investigation in polycrystalline aluminum and aluminum alloys
Resistivity changes during creep of aluminum alloys
Ductility and creep-rupture properties of nickel

Michigan U. Research Inst., Ann Arbor.
NOTCH SENSITIVITY OF AIRCRAFT STRUCTURAL AND ENGINE ALLOYS. PART II. FURTHER STUDIES WITH A-286 ALLOY, by Howard R. Voorhees and James W. Freeman. Rept. for Jan 57-Mar 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3380. Jan 59, 67p. 11 refs. WADC Technical rept. no. 57-58, Pt. 2; AD-207 850.
Order from OTS $1.75 PB 151 738

Sufficient data on a single lot of A-286 alloy were obtained at 1200°F to permit future evaluation of an analysis for notched-bar rupture life in terms of normal creep-rupture properties. Circumferential notches with theoretical stress concentration factors (K_t) of 3.0 or less increased rupture time of materials with a 2200°F solution temperature, despite smooth-bar elongations as low as 0.5% or below. Notch behavior varied widely with notch geometry in tests on specimens with 1800°F solution temperature. Transition to notch sensitivity at longer time periods was, however, positively demonstrated for several notch geometries. The creep rate of a smooth bar at any time in a variable-stress test appeared to be a unique function of the existing stress level and the cumulative portion of rupture life already expended. Firm criteria for creep rupture under a general state of variable complex stress are still lacking for the desired evaluation and extension of the proposed calculation methods.

Naval Ordnance Lab., White Oak, Md.
NICKEL-IRON MAGNETIC STRIP BY METAL

POWDER ROLLING, by William M. Hubbard, John F. Haben, and Edmond Adams. 26 Jan 59, 25p. 9 refs. NAVORD rept. no. 6257.
Order from LC mi$2.70, ph$4.80 PB 140 384

A new technique for the preparation of magnetic nickel-iron alloys, such as 4-79 Mo-Permalloy and Mumetal, was investigated. Constituent metal powders were rolled directly into strip and diffused into the alloy by sintering. The magnetic characteristics attained were consistently equivalent to those of commercial alloys of the same composition.

Naval Ordnance Lab., White Oak, Md.
PRECIPITATION HARDENABLE IRON - ALUMINUM ALLOYS, by W. J. Buehler and C. G. Dalrymple. 8 Jan 59, 25p. 4 refs. NAVORD rept. 6252.
Order from LC mi$2.70, ph$4.80 PB 140 383

Hardening effects of individual additions of titanium, copper and nickel to a base composition of 8% aluminum, remainder iron, are discussed. Additions of 1 - 3.5% Ti and 1 - 3% Ni resulted in precipitation hardenable alloys which reached a maximum hardness at 600°C following a solution treatment.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
THE ELECTRICAL PROPERTIES OF ARMCO IRON AND BERYLLIUM, by F. K. Lampson. Summary rept. 4 May 51, 9p. 6 refs. NEPA-1860.
Order from LC mi$1.80, ph$1.80 PB 140 790

The electrical resistivity of Armco Iron and beryllium has been determined over a wide range of temperatures. The beryllium investigation was conducted in both purified helium and in vacuo, while iron was checked solely in a helium atmosphere. The resistivity of iron is reported up to 2450°F, which is an extension of approximately 300°F over any values found in the literature. The ferrite - austenite transformation is evident over the range of temperatures from 1670°F to 1700°F, which is in close agreement to literature values. The resistivity of beryllium metal (Brush grade QM-V) is reported from room temperature to 2000°F. The resistivity-temperature relation is linear from room temperature to 1400°F; thereafter, the resistivity increases rapidly with a subsequent increase in temperature. No. phase change occurs in the beryllium throughout the temperature range of this investigation.

[Science and Technology Div.] Library of Congress, Washington, D. C.
THERMAL PROPERTIES OF CERTAIN METALS, by Thomas C. Goodwin, Jr. and Mauree W. Ayton. Rept. for 1 July 55-30 June 56, Contract AF 33(616)55-10. Aug 56 [256]p. 380 refs. WADC Technical rept. 56-423; AD-111 846.
Order from LC mi$11.10, ph$42.60 PB 140 392

Syracuse U. Research Inst., N. Y.
THE DEVELOPMENT OF A PRACTICAL FORGEABILITY TEST; EFFECT OF FRICTION IN FORGING AND THE DETERMINATION OF FORGEABILITY BY COMPRESSION TESTS, by K. N. Tong, B. B. Muvdi, and G. Sachs. Interim technical rept. no. 2 on Contract DAI-30-115-505-ORD(P)-668. Apr 56, 44p. 23 refs. MET369-564T2.
Order from LC mi$3.30, ph$7.80 PB 140 334

Two series of tests were performed in order to determine frictional constants during the forging of lead specimens: (a) compressing both cylindrical and rectangular lead prisms between plates that were ground, and vaseline lubricated: (b) the plates were made rougher by machining annular gooves and both cylindrical and rectangular lead specimens (1% antimony-lead) were tested, using no lubrication.

Ferrous Metals

Armour Research Foundation, Chicago, Ill.
EFFECT OF ALLOYING ELEMENTS ON IMPACT PROPERTIES OF QUENCHED AND TEMPERED STEELS, by M. Baeyertz, W. F. Craig, Jr. and J. P. Sheehan. Rept. no. 22 (Technical) on Contract N6onr-274(01). 1 Sep 49, 320p. 5 refs. ATI-66 620.
Order from LC mi$11.10, ph$48.60 PB 136 745

The effects of alloying elements and homogeneity on longitudinal notched-bar impact properties of tempered martensite are discussed. Eight alloy grades were studied. These alloys contained either manganese, nickel, and chromium, or combinations of these elements with each other or with molybdenum. Testing temperatures varied from -320°F to a temperature sufficient to exceed the transition range revealed by the impact test. The major effect of alloying elements is confined to their influence on the tempering rate. Except for brittleness, tempered alloy martensites show marked similarity in the general pattern of longitudinal notched-bar behavior.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
INHIBITION OF HYDROGEN EMBRITTLEMENT DURING PICKLING, by R. C. Bertelson. Rept. no. 2 on Synthesis of 6-Methyl-3-(p-tolyl)-3, 4-Dihydroquinazoline. 19 Feb 59, 13p. 9 refs. Rept. CCL #74.
Order from LC mi$2.40, ph$3.30 PB 140 306

The substance 6-methyl-3-(p-tolyl)-3, 4-dihydroquinazoline has been isolated as a principal component of the hydrogen embrittlement inhibitor described in MIL-A-13528 (ORD) (originally U. S. Army 4-105). The object of this study was to develop a commercially feasible synthesis of this compound. The published procedure has been significantly improved in yield and ease of operation, cutting the cost of this compound by 60% or more. The synthesis is carried out in one step and gives about a 53% yield of purified product.

Massachusetts Inst. of Tech., Cambridge.
THE FLADE POTENTIAL OF IRON PASSIVATED BY VARIOUS INORGANIC CORROSION INHIBITORS, by Herbert H. Uhlig and Peter F. King. [Rept. on Contract Nonr-1841(09)]. [1956] 26p. 38 refs.
Order from LC mi$2.70, ph$4.80 PB 140 627

The characteristic potential obtained just before decay of passivity was measured for iron passivated by ferrates, nitrites, chromates, molybdates, tungstates, conc. HNO_3 and by anodic polarization in H_2SO_4. The standard potential (pH = O) for various passivators is increasingly noble in the order: nitrite (-. 50 V); chromate, ferrate, molybdate (-. 54 V); tungstate (-. 61 V); and anodic polarization or conc. HNO_3 (-. 64 V).

Watertown Arsenal Labs., Mass.
EFFECT OF SPECIMEN GEOMETRY ON CHARPY LOW-BLOW TRANSITION TEMPERATURE, by George M. Orner. Technical rept. no. 2 on Ferrous Metals Problems. July 53, 21p. 3 refs. Rept. no. WAL TR 112/87-6.
Order from LC mi$2.70, ph$4.80 PB 140 642

The Charpy low-blow transition temperature is considered to represent the maximum temperature at which an initiating crack can propagate in a brittle (catastrophic) manner in a heavy section where the energy absorbed by the shear lips is negligible compared with the elastic energy available for crack propagation. The effect of striking the crack-initiating low blows at room temperature instead of at the temperatures selected for crack propagation was investigated. The results indicate that this modification of the testing technique has no measurable effect on the temperature at which low-blow transition occurs.

Light Metals

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
ENDURANCE TESTS OF ALUMINUM ALLOY AL-195 CONTAINING VARIOUS DEGREES OF POROSITY, by Anthony E. Cerbara. Rept. for 5 Jan-28 Oct 53. 1 Apr 54, 37p. 2 refs. Rept. no. AML NAM AE 4132, Pt. 1.
Order from LC mi$3.00, ph$6.30 PB 140 388

The fatigue strength for porosity degrees Nos. 1 through 8 for aluminum casting alloy AL-195 were determined. It was found that the endurance limit decreased as the degree of porosity increased, varying from 11,000 PSI for degree No. 1 to approximately 6000 PSI for degree No. 8.

Battelle Memorial Inst., Columbus, Ohio.
HYDROGEN CONTAMINATION IN TITANIUM AND TITANIUM ALLOYS. PART V. HYDROGEN EMBRITTLEMENT, by D. N. Williams, F. R. Schwartzberg, and R. I. Jaffee. Rept. for Mar 57-Mar 58 on Metallic Materials, Contract AF 33(616)5007. Feb 59, 100p. 10 refs. WADC Technical rept. 54-616, Pt. 5; AD-209 378.
Order from OTS $2.25 PB 151 778

Extensive investigations intended to provide information relating to the mechanism of hydrogen embrittlement in titanium-base alloys were carried out. Studies included detailed measurements of the effects of temperature, strain rate, and hydrogen content on hydrogen embrittlement; examination of all-alpha and all-beta alloys for susceptibility to hydrogen embrittlement; calculations of probable hydrogen solubility in alpha and beta titanium; and several other informative investigations. An embrittlement mechanism is outlined. Alloys previously prepared and examined to determine the effects of alloy content and microstructure on hydrogen embrittlement (WADC TR 54-616, Part IV, PB 131 516) were further studied by means of notched stress-rupture tests. This work has resulted in some alteration in previously expressed conclusions regarding alloying and microstructural effects.

Central Inst. for Industrial Research (Norway)
OXIDATION OF TITANIUM, by Tor Hurlen, Hallstein Kjollesdal and others. Final technical rept. for Apr 57-31 Mar 58. on Contract AF 61(514)892. Apr 58, 119p. WADC TR-58-296; AD-155 638.
Order from OTS $2.50 PB 151 236

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EMISSION SPECTROGRAPHIC DETERMINATION OF IMPURITIES IN 65/35 AND 50/50 MAGNESIUM/ALUMINUM ALLOYS, by Seymour Lader. Apr 59, 24p. 9 refs. Technical rept. 2602; AD-210 008.
Order from LC mi$2.70, ph$4.80 PB 140 525

A suitable spectrographic method has been found for determining the following elements (in the specified percentage ranges) in powdered magnesium/aluminum alloys: iron (0.07 - 1.0), silicon (0.07 - 1.0), chromium (0.07 - 1.0), titanium (0.07 - 1.0), lead (0.07 - 1.0), zinc (0.07 - 1.0), and tin (0.07 - 1.0). Larger percentages can be determined by diluting the sample with suitable matrix material. An analysis of synthetic samples shows that this method has a range of errors of estimate from ±10.6 to ±12.0 for the 50/50 alloys and from ±10.2 to ±11.9 for the 65/35 alloys. When representative samples available in the laboratory were analyzed, the coefficient of variation of the impurities was found to be from 4% to 10%.

Institute of Engineering Research, U. of California, Berkeley.
THE EFFECT OF STRESS ON THE CREEP BEHAVIOR OF HIGH PURITY ALUMINUM IN THE REGION OF DISLOCATION CLIMB, by A. Bayce, W. Ludemann and others. Rept. for 31 Jan 58-31 Jan 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3860. Mar 59, 34p. 23 refs. WADC Technical rept. 58-507; AD-211 850.
Order from OTS $1.00 PB 151 783

The effect of stress on the creep rate in the dislocation climb region was investigated by increasing and decreasing the stress abruptly during the course of primary creep of high purity aluminum. These investigations revealed that a simple functional relationship between creep rate and stress does not exist; the effect of stress on the creep rate depended on the substructure as well as the stress. In general the creep of aluminum under conditions of changes in stress can be resolved qualitatively in terms of dislocation climb models for creep.

Watertown Arsenal Labs., Mass.
NOTCH SENSITIVITY AND RESISTANCE TO TEARING OF TITANIUM ALLOY SHEET, by S. V. Arnold. Rept. on Materials for Lightweight Construction. Titanium Alloys, Mechanical Properties. Apr 59, 18p. 5 refs. Technical rept. no. WAL TR 405.2/3; AD-210 868.
Order from LC mi$2.40, ph$3.30 PB 140 559

Test of titanium sheet alloys Ti-5%Al-2.5%Sn, Ti-8%Al-2%Cb-1%Ta, Ti-6%Al-4%V, and Ti-4%Al-3%Mo-1%V in gages ranging from ,020-.137" thickness using the laminated Charpy impact specimen has disclosed that fracture may occur by three modes, one brittle and two ductile. Ti-5%Al-2.5% Sn, Ti-8%Al-2%Cb-1%Ta, and Ti6%Al-4%V all showed ability to develop high impact energy absorption in heavier sheet thickness.

Nonferrous (except light) Metals

Brown U. Div of Engineering, Providence, R. I.
A STUDY OF THE STRUCTURE AND SINTERING MECHANISM OF CEMENTED CARBIDES (PART I); SOME THEORETICAL ASPECTS OF PROBLEMS RELATED TO TWO-PHASE MATERIALS (PART II) by J. Gurland and M. J. Schilhansl. Final technical rept. on Contract DA 19-020-ORD-3976. May 58, 81p. 29 refs. WAL rept. 893/195-2.
Order from LC mi$4.80, ph$13.80 PB 140 299

An experimental investigation of the structure of sintered WC-Co and TiC-Co alloys was carried out by means of dilatometric and metallographic methods. It was concluded that the sintering of cemented carbides takes place by transport of particles through the liquid binder, followed by grain growth and coalescence of carbide grains. An analysis of stresses in two-phase materials by the theory of elasticity shows that for simple models of spherical particles the principal stresses on the dispersed phase are of the same sign. Stress concentrations are introduced by non-uniform distribution of matrix and by irregular shapes of particle. In the case of prismatic grains, the stress concentration is highest at the corners and contribute to the deformation of carbide and binder at these locations.

Ohio State U. Research Foundation, Columbus.
PROTECTION OF NIOBIUM AGAINST OXIDATION AT ELEVATED TEMPERATURES, by J. W. Spretnak and Rudolph Speiser. Rept. no. 16, 16 July 57-15 Mar 58, on Contract N6onr-225(28). 28 Mar 58, 23p. 7 refs. Rept. 467-16.
Order from LC mi$2.70, ph$4.80 PB 139 163

Determination of the physical properties of the niobates and the study of the niobium-titanium-chromium ternary system and the niobium-zirconium binary system with respect to oxidation behavior.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
EFFECT OF TESTING TEMPERATURE ON THE PROPERTIES OF WROUGHT COPPER BASE ALLOYS, by H. R. Pritchard. Survey of literature. Feb 58, 92p. 36 refs. Rept. R-1435.
Order from OTS $2.25 PB 151 306

The effect of low temperatures is to increase the tensile and yield strengths, the elongation, modulus of elasticity, hardness, and fatigue strength from their room temperature values. The reduction of area usually does not show any significant change. The electrical resistivity decreases with decreasing temperature. At elevated temperatures, the tensile and yield strengths, modulus of elasticity, and hardness decrease, while the thermal conductivity and electrical resistivity increase. Fatigue data at elevated temperatures were not available.

Structural Metallurgy and Corrosion

Bureau of Yards and Docks, Washington, D. C.
CORROSION PREVENTION. Part M of Maintenance and Operation of Public Works and Public Utilities. 7 Dec 56, 439p. 51 refs. Technical pub. NAVDOCKS TP-PW-30; BUDOCKSINST 11014.7, Sup 10.
Order from OTS $6.00 PB 151 756

Corrosion losses at the facilities that comprise the Shore Establishment can, when not properly controlled, reach into very large dollar figures. In this publication are assembled newly developed data on atmospheric, submerged, and subsurface corrosion, and corrosion data on areas alternately wet and dry. The latest and most practicable methods and materials for controlling or minimizing corrosion are described in detail. Certain new materials, and nonmetallic materials such as plastics, will be found very effective in reducing or even eliminating some forms of corrosion. The cathodic protection techniques described herein should be of value in the control of corrosion on aboveground structures, underground structures, and marine structures that are permanently submerged.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
CONDITIONING TREATMENT FOR ACID CLEANED COOLING SYSTEM, by M. Rosenfeld. 4 Dec 58, 13p. Rept. no. CCL #69.
Order from OTS $0.50 PB 151 527

Purpose is to determine treatment effective in giving cooling systems maximum trouble-free useful life with water or aqueous anti-freeze systems, regardless of chloride, sulfate, or hardness content. Studies were limited to soft water low in chlorides and sulfates. For these systems, cleaning at proper intervals with MIL-C-10597B(ORD) cleaner followed by conditioning by the newly developed method extends the use life of the cooling system over four hundred percent of that attained currently.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
A METHOD FOR PREDICTING SOLUTION BREAKDOWN OF PHOSPHORIC ACID METAL CONDITIONING BATHS, by M. H. Swann. 20 Oct 58, 10p. Rept. CCL #66.
Order from OTS $0.50 PB 151 431

An accurate method for predicting the solution breakdown of phosphoric acid metal-conditioning and rust-removing baths was needed and requested by the Field Service Division of the National Maintenance Branch in order to derust parts and assemblies on a production basis without causing production delays. Analysis for free acid and total iron were found to be inadequate for making accurate predictions. A volumetric method was developed for predicting exhaustion from tolerance of an aliquot portion for a concentrated reagent solution of monosodium phosphate. The new method is both rapid and dependable and will predict exhaustion independently of the nature of the dissolved contaminants.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
STORAGE STABILITY OF LOW TOXICITY CARBON LOOSENER (P-C-111a) COMPARISON FORMULA, by R. E. Wagner, Jr. 18 Feb 59, 5p. Rept. no. CCL #71.
Order from LC mi$1.80, ph$1.80 PB 140 369

The performance tests of Federal specification P-C-111a were run on the cleaner after various times of storage. The same batch of cleaner was therefore compared after different aging period. After 18 months the cleaner performs as satisfactorily as fresh cleaner. The corrosion of some metals has increased, but the actual thickness of metal removed is negligible. It is concluded that the carbon removing compound is satisfactory for use after 18 months storage.

Honeywell Research Center, Hopkins, Minn.
A PRELIMINARY EVALUATION OF THE SILVER CHLORIDE-ALUMINA SYSTEM AS A MEANS OF STUDYING FINE PARTICLE STRENGTHENING OF SOLIDS, by T. L. Johnston, R. J. Stokes, and C. H. Li. Technical rept. no. 2 on Contract Nonr-2456(00). July 58, 29p. 13 refs.
Order from LC mi$2.70, ph$4.80 PB 140 440

In metals and alloys hardened by the addition of a dispersed phase (e.g., cermets, S.A.P.-type materials) it is difficult experimentally to study the relationship between microstructural parameters and resistance to deformation, fracture, and recovery. To overcome this difficulty, the silver chloride - alumina system has been adopted. Silver chloride has the unique advantage of being ductile and transparent. Furthermore, dislocations can be readily decorated at room temperature.

Minerals Research Lab., U. of California, Berkeley.
STUDY OF CLEAVAGE CRACK PROPAGATION IN A ZINC SINGLE CRYSTAL, by T. L. Johnston, R. B. Shaw, and R. J. Stokes. Technical rept. no. 17 on Contract N7onr-295(16). Oct 57, 37p. 10 refs. Series no. 27, issue no. 17.
Order from LC mi$3.00, ph$6.30 PB 136 668

Experiments to determine the energy necessary to cleave a single crystal of zinc under conditions whereby the force, crack propagation rate, and position of the crack front could be recorded simultaneously and correlated with microscopic features of the matching cleavage surfaces. Description of the interaction found between a growing crack and small angle boundaries located in the path of the advancing fracture.

Rock Island Arsenal Lab., Ill.
PROTECTIVE INFLUENCE OF SUPPLEMENTARY COATINGS ON CADMIUM AND ZINC ELECTROPLATE, by J. Knanishu. 9 Mar 59, 25p. 6 refs. Rept. ono. 59-693; AD-211 945.
Order from LC mi$2.70, ph$4.80 PB 140 495

Steel panels were cadmium or zinc plated. All panels were then phosphated in a nitrate-accelerated phosphatizing solution. Half of each panel was sprayed with semi-gloss enamel. These panels were exposed to Salt Spray (fog) Cabinet and outdoor atmospheres. Outdoor exposure tests are continuing after 553 days without any indication of breakdown on the painted or phosphated half of either the zinc or cadmium plated panels.

Rock Island Arsenal Lab., Ill.
TEST METHODS FOR THE ANALYSIS OF ALKALINE DERUSTING COMPOUNDS, by Jodie Doss. 13 Mar 59, 20p. 9 refs. Rept. no. 59-731; AD-211 946.
Order from LC mi$2.40, ph$3.30 PB 140 496

Test methods were devised for constituents such as caustic soda (NaOH), sodium cyanide (NaCN), tetrasodium ethylenediaminetetraacetate, hydroxylethylenediaminetriacetic acid, gluconates, and gluconate-hydroxyethylenediaminetriacetic acid complex agent mixtures. Their application to alkaline derusting materials is discussed.

Rock Island Arsenal Lab., Ill.
VCI BIBLIOGRAPHY AND ABSTRACTS, by R. L. Le Mar. 16 Oct 58, 117p. 324 refs. Technical rept. no. 58-2834.
Order from OTS $2.50 PB 151 766

A bibliography relative to volatile corrosion inhibitors (VCI) covering published information from 1937 to 1957 was prepared. Most references were abstracted and these abstracts are included. The literature was divided into six sections as follows: 1. Armed Forces and Government 2. Military Specifications 3. Manufacturer and Industrial 4. Trade Journals 5. Technical Journals 6. Patents a. U.S.A. b. Foreign.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Convair, Fort Worth, Tex.
ENVIRONMENTAL RADIOACTIVITY IN THE NTA TEST AREA AND FLIGHT CORRIDOR, by R. F. Shockley and W. R. Miller. Rept. on Contract AF 33(600)32054. 25 Nov 57, 81p. NARF-57-51T; Rept. no. 3-R-72R, rev. C.
Order from LC mi$4.80, ph$13.80 PB 140 717

A study has been conducted of the effects on the environs of an operating airborne nuclear reactor. The environs studied include certain sections of Texas and New Mexico. Analysis of the data and a study of the operational history of the Nuclear Test Airplane led to the conclusion that there was no change in the environmental radioactivity attributable to operation of the Nuclear Test Airplane.

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT FOR THE PERIOD ENDING JUNE 30, 1947, by J. R. Zacharias, E. R. Gilliland and others. Rept. on Contract N5ori-078, T. O. 6. 1 July 47, 160p. 23 refs.
Order from LC mi$7.50, ph$24.30 PB 140 430

This is a report of progress over the entire fifteen months of operation under the present contract. The progress is reported under the following group headings: (1) Theoretical group; (2) cosmic ray group; (3) synchrotron group; (4) high voltage research group; (5) nuclear cross sections group; (6) nuclear inorganic chemistry group; (7) nuclear organic chemistry group; (8) radioactivity and cyclotron group; (9) instrumentation and health physics group.

Maryland U., College Park.
ELECTRON SPIN RESONANCE OF ULTRAVIOLET IRRADIATED COMPOUNDS. I. UNSATURATED HYDROCARBONS, by Charles P. Poole, Jr. (Doctoral thesis) and Roy S. Anderson. Rept. on Contract AF 18(600)1582. [1959] 31p. 31 refs. Technical rept. no. 120; AFOSR-TN-59-407; AD-214 504.
Order from LC mi$3.00, ph$6.30 PB 140 505

Trapped radicals, formed by ultraviolet irradiation of pure, unsaturated aliphatic hydrocarbons, maintained at 77°K, have been observed with a 3-cm electron spin resonance spectrometer at a g-factor of two. Radical formation and stabilization is attributed to the separation from the parent molecule of highly mobile hydrogen and methyl radicals which diffuse away from the remaining radical fragments, and eventually react with their environment or recombine. Stabilization of remaining fragments then occurs because of immobility and structural resonance. Consideration is given to the existence of radicals resulting from secondary hydrogen addition reactions.

Technical Research Group, Syosset, N. Y.
RESEARCH ON NUCLEAR MAGNETIC RESONANCE TECHNIQUES, by M. Newstein. Final rept. on Contract AF 18(600)1313. Apr 59, 103p. 14 refs. AFOSR TR-59-26; AD-212 008.
Order from LC mi$5.70, ph$16.80 PB 140 624

This final report consists of a resume of the Technical Notes, numbered one to four, and a more complete discussion of the work done on Optical Detection of Magnetic Resonance.

Weizmann Inst. of Science (Israel).
TABLES OF EXCHANGE BROADENED N-M-R MULTIPLETS. Technical note no. 2 on Contract AF 61(052)03. [1958] 65p. 7 refs. AFOSR TN-59-292; AD-213 032.
Order from LC mi$3.90, ph$10.80 PB 140 692

Elementary Particles

General Atomic, San Diego, Calif.
IONIZATION OF ATOMIC AND MOLECULAR OXYGEN ON ELECTRON IMPACT, by W. L. Fite and R. T. Brackmann. Rept. on Contract AF 49(638)356, Mar 59, 17p. 10 refs. GA-632; AFOSR TN-59-18; AD-208 599.
Order from LC mi$2.40, ph$3.30 PB 139 995

Ohio State U. Research Foundation, Columbus.
ELECTRONIC COLLISION CROSS SECTION OF WATER VAPOR, by E. N. Lassettre and E. Roderick White. Scientific rept. no. 12 on Contract AF AF 19(122)642. Mar 58, 61p. 15 refs. AFCRC TN-58-460; AD-152 643.
Order from LC mi$3.90, ph$10.80 PB 136 743

A comprehensive study has been made of the absolute collision cross sections and energy spectra of water vapor at 500 volts and several scattering angles.

Pittsburgh U., Pa.
ON THE ANALYTIC PROPERTIES OF THE SCATTERING MATRIX WITH SOME APPLICATIONS, by Benjamin W. Lee. Master's thesis. Technical rept. no. 6 on Capture-Loss and Ionization Cross-sections of Ions and Neutral Particles, Contract Nonr-624(06). July 58, 38p. 23 refs.
Order from LC mi$3.00, ph$6.30 PB 140 397

The analytic properties of the S-matrix in the non-relativistic one particle scattering problems are investigated, and previous works are reviewed. A relation between the S-matrix and the Green's function is obtained and the "redundant" poles of the S-matrix are discussed in the light of this relation. The Breit-Wigner resonance formula is shown to follow correctly from the analytic properties of the S-matrix. Neutron-proton potentials are discussed in the light of the mathematical properties of the S-matrix.

Uppsala U. (Sweden).
ANTIPROTON INTERACTIONS, by G. A. Ekspong and

B. E. Ronne. Technical note no. 1 on Contract AF 61(052)13, phase A. 1958, 9p. 3 refs. AFOSR TN-58-878; AD-203 910.
Order from LC mi$1.80, ph$1.80 PB 136 864

Data on 200 antiprotons with a total path length of 19.1 m are reported. The antiprotons were observed in G-5 emulsion exposed to the enriched antiproton beam of the Bevatron. The average mean free path is 18.2 1.8 cm. The annihilation cross sections at five energies are shown. Six proton elastic scattering events are reported. Four events of inelastic scattering on complex nuclei were found.

Uppsala U. (Sweden)
DECAY MODES AND LIFETIME OF NEGATIVE HEAVY MESONS, by S. Nilsson and A. Fisk. Technical note no. 3 on Contract AF 61(052)13, phase A. [1958] 21p. 22 refs. AFOSR TN-58-880; AD-203 908.
Order from LC mi$2.70, ph$4.80 PB 136 741

21 events representing possible decays of a negative K-meson in emulsion have been measured in order to get the relative abundances of different decay modes, an estimate of the contamination from nuclear reactions and a determination of the mean lifetime.

Uppsala U. (Sweden).
K^- INTERACTIONS IN FLIGHT, by A. Frisk and S. Nilsson. Technical note no. 2 on Contract AF 61(052)13, phase A. 1958 7p. AFOSR TN-58-879; AD-203 909.
Order from LC mi$1.80, ph$1.80 PB 136 865

Data on K^- meson interactions and decays in flight obtained in two stacks of nuclear emulsion exposed to the 400 Mev/c and 300 Mev/c K^- meson beams of the Bevatron are reported. A total of 1124 K^- tracks were followed. 818 interacted at rest, 212 interacted in flight, and 103 left the stack. In 10 cases the K^- reemerged from the interaction. The interactions in flight are summarized. (See also PB 136 864)

Westinghouse Research Labs., Pittsburgh, Pa.
RESEARCH IN FAST NEUTRON SCATTERING AND OTHER FIELDS, by B. Jennings. Final rept. for 13 Aug 46-30 Apr 58 on Contract N6ori-156[02]. 4 June 58, 27p. 100 refs. Navy rept. 67F597-R14.
Order from LC mi$2.70, ph$4.80 PB 140 432

A brief outline of research in measurement of (p, n) thresholds; research using the University of Pittsburgh cyclotron; research in neutron physics, 1952-1958; neutron spectroscopy; the time-of-flight spectrometer; neutron spectroscopy and gamma ray research; the zirconium problem; use of separated isotopes; angular distribution of elastically scattered neutrons; measurement of the angular distribution of de-excitation gamma rays; and theoretical research.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SILVER ACTIVATION OF ZINC SULFIDE SINGLE CRYSTALS FOR SCINTILLATION COUNTING, by Clyde Wilbur Moore. Master's thesis. Mar 59, 54p. 13 refs. GNE-59-11.
Order from OTS $1.50 PB 151 793

The development of large zinc sulfide single crystals and their use as scintillators is discussed. A method for activating single crystals of zinc sulfide with silver is presented, and the spectral properties of the product are analyzed. Results of efforts to use the crystals as alpha particle detectors.

Chemical Corps School [Army Chemical Center, Md.]
THEORY AND OPERATION OF RADIAC INSTRUMENTS. Draft, Feb 51. 194p. Department of Defense Special text ST RDS-5.
Order from LC mi$8.70, ph$30.30 PB 140 302

Contents:
Chapter 1. Introduction
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Miami U., Coral Gables, Fla.
STUDIES OF IONIZATION PARAMETERS IN NUCLEAR EMULSIONS, by M. Blau, S. C. Bloch and others. Rept. on Contract AF 49(638)97. 4 Feb 59, 33p. 20 refs. AFOSR TN-59-229; AD-211 842.
Order from LC mi$3.00, ph$6.30 PB 140 224

A semi-automatic instrument for inonization measurements in emulsion is briefly described. The instrument was used in the investigation of the various ionization parameters. Deviations from a purely exponential gap length distribution were observed, a result found earlier by Cortini et al. This observation casts some doubt on the unrestricted use of the mean gap length as a parameter. A new parameter, based on the blob length distribution, and which is useful over the entire ionization range, is proposed. The relation of this parameter to grain density is discussed. It is shown that the behavior of the latter (as determined from the blob length distribution) as a

function of restricted ionization loss seems to be in agreement with theoretical expectations, with the exception of the very dense region, where appropriate corrections are proposed.

Naval Ordnance Lab., White Oak, Md.
A BETA-RAY GAGE FOR MEASURING THE THICKNESS OF THIN MAGNETIC TAPE, by Hugh Maillie and Norman Modine. 10 Oct 57, 13p. NAVORD rept. 5749; AD-157 238.
Order from OTS $0.50 PB 151 529

A beta-ray thickness gage was developed to measure ultra-thin magnetic tapes without removing them from the roller. The optimum choices of source and detector for this application were determined by a study of available beta emitters and types of dectectors. The best source was a linear deposit of 5 microcuries of carbon-14 as sodium carbonate. The best detector was an end window Geiger tube feeding an automatic scaler. The gage was calibrated for molypermalloy tape 3/8" wide and from 0.0001" to 0.001" thick. A standard error of ± 1 1/2% was achieved with counting times of a few minutes.

Naval Research Lab., Washington, D. C.
THERMOLUMINESCENT DOSIMETER, by J. H. Schulman, R. J. Ginther and others. Interim rept. 1 June 59, 11p. 14 refs. NRL rept. 5326.
Order from OTS $0.50 PB 151 725

The use of thermoluminescence for radiation dosimetry is described and the limitations of previously employed thermoluminescent dosimeters are pointed out. It is shown that a special manganese-activated calcium fluoride phosphor permits detection of x-ray and gamma-ray doses in the milliroentgen range and offers promise as a replacement for the photographic film badge in health physics applications. The dosimeter consists of a coating of the phosphor bonded to a small metal supporting disk by conventional enameling techniques. It is read by inserting it into a small preheated oven, which causes the dosimeter to luminesce with an intensity proportional to the radiation dose. The thermoluminescence is measured by a phototube and recorded.

New York U. Coll. of Engineering, N. Y.
EFFECT OF GASEOUS IMPURITIES IN BF_3 PROPORTIONAL COUNTERS, by J. Davilla-Aponte. Rept. on Contract AF 18(600)1555. Dec 58, 56p. 12 refs. AFOSR TN-59-162; AD-211 141.
Order from LC mi$3.60, ph$9.30 PB 140 619

The effects which SiF_4, SO_2, SF_6 have on the plateau and pulse size distribution of a proportional counter were investigated. SiF_4 was tested at three pressures; 30, 45, and 60 cm. of BF_3 and its effect was found to be independent of the counter pressure for the range of values considered. From the variation in the plateau, the attachment probability for SiF_4 was calculated to be $h = 1.458 \times 10^{-5}$ and its cross section for attachment to be $\sigma_a = 5.12 \times 10^{-20}$ cm^2. The permissible amount of these gases without the counter being affected beyond the limits of tolerance which are set up were found to be 0.04% for SiF_4, 0.01% for SO_2, and 2.0×10^{-6}% for SF_6.

Radioactivity

Air Force Cambridge Research Center, Bedford, Mass.
RADIOACTIVE AGGREGATES IN THE STRATOSPHERE, by Herman Yagoda. Mar 59, 25p. 6 refs. GRD Research notes no. 10; AFCRC-TN-59-201; AD-212 423.
Order from OTS $0.75 PB 151 762

Dust collected from two ballon flights at 100,000-and 112,000-foot elevations have been tested for radioactivity by incorporating the dust particles into a nuclear emulsion and developing the tracks produced by associated alpha and beta particle emissions. The dust collected on a balloon launched at Minneapolis, Minnesota on 16 August 1958 exhibited 1.7 radioactive dust particles per cm^2 of collector surface after 11.5-hour flight above 60,000 feet. The fission-colloid concentration on this flight is about 1500 times greater than the corresponding sea-level fallout in emulsions prepared in England in 1955. Details of emulsion preparation and development are described. A phenomenological classification of radioactive dust particles is presented together with photomicrographs of typical categories.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
PROTECTION OF ENGINEER EQUIPMENT OPERATORS IN RADIOLOGICALLY CONTAMINATED AREAS, by William H. Van Horn. 3 Feb 59, 61p. 4 refs. Technical rept. no. 1565-TR.
Order from LC mi$3.90, ph$10.80 PB 140 217

The advent of high-yield weapons which can grossly contaminate large areas necessitated a re-evaluation of the capabilities of the military organization for decontamination and land reclamation. The purpose of the work reported was to determine the shielding characteristics of standard and developmental engineer heavy equipment (items which could be used for decontamination work) and to ascertain methods for increasing the inherent shielding provided by standard engineer heavy equipment. The field work accomplished to determine the best geometry and thickness of lead for a shielded cab and the testing of a prototype lead cab were carried out at (1) the Engineer Proving Ground (EPG), Fort Belvoir, Virginia; (2) Pelham Range, Fort McClellan, Alabama; and (3) the Nevada Test Site during Exercise Desert Rock VII. Tests were performed by members of the Special Projects Branch, Military Engineering Department, USAERDL, on seven types of equipment. The investigation indicated that engineer heavy equipment inherently offers a considerable degree of shielding and that further shielding can be achieved by the addition of protective lead cabs.

Naval Radiological Defense Lab., San Francisco, Calif.
COST AND EFFECTIVENESS OF DECONTAMINATION PROCEDURES FOR LAND TARGETS, by J. D. Sartor, H. B. Curtis and others. 27 Dec 57, 114p. 17 refs. Research and development technical

rept. USNRDL-TR-196.
Order from LC mi$6.00, ph$18.30 PB 140 269

With few exceptions, the methods evaluated were 95 to 99 percent effective in the removal of the contaminant from the paved and roofing test areas. The motorized flushing procedure required the least effort in achieving the reported effectiveness for paved areas and the firehosing procedure ranked lowest in effort expended on roofing areas. Costs were arrived at which are not considered as necessarily optimum. The synthetic fallout, developed to provide the contaminant, was satisfactory and is recommended for use in field operations of the nature and scope of this series of tests.

Naval Research Lab., Washington, D. C.
ATMOSPHERIC RADIOACTIVITY LEVELS AT YOKOSUKA, JAPAN, 1954-1958, by L. B. Lockhart, Jr. Interim rept. 21 Apr 59, 9p. 4 refs. NRL rept. 5301.
Order from LC mi$1.80, ph$1.80 PB 138 794

This report summarizes measurements made on the concentrations of some natural radioactive materials and of gross fission products in the air at ground level at Yokosuka, Japan, during the period 1954-1958. The data presented supports the conclusions that the concentrations of both natural radioactive products and fission products in the air at ground level vary widely from time to time, that the change in the concentration of the natural radioactivity is related in a general way to the phenomena controlling preciptation, and that the trend of the fission product concentration is upward during the past few years as a result of increased nuclear testing, but that the radioactivity due to fission products in the air contributes only a small fraction of the total activity of the air.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Applied Mathematics and Statistics Lab., Stanford U., Calif.
BAYES SOLUTIONS OF THE STATISTICAL INVENTORY PROBLEM, by Herbert Scarf. Technical rept. no. 40 on Contract N6onr-251(40). 5 May 58, 36p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 140 702

[Naval Supply Research and Development Facility, Brooklyn, N. Y.]
DEVELOPMENT AND EVALUATION OF STRETCHABLE RUBBER OVERSHOES, by M. Bailey. Rept. on Service Footwear. 30 June 58, 22p. Research and Development rept. no. 20.
Order from LC mi$2.70, ph$4.80 PB 135 970

This report discusses the development and evaluation of a molded, elastic overshoe which was design to satisfy a need for a lighter, more acceptable item among Navy men. This new item was systematically compared to the standard rubber in the laboratory as well as in wear tests. This comparison showed that the test rubber and the standard rubber were similar in wear characteristics under ordinary conditions. However, on rough terrain, during continuous wear, the test rubbers tore readily and their soles split open. Standard rubbers resisted snagging and their soles were not split or cut.

Pioneer Scientific Corp., Great Neck, N. Y.
DOUBLE-WALLED FACEPIECES MA-1A ALTITUDE HELMET, by J. W. Weinberg. Rept. on Physiology of Flight, Contract AF 33(616)3774. Mar 59, 60p. 10 refs. WADC Technical rept. 58-643; AD-212 313.
Order from OTS $1.50 PB 151 784

The problem was the design and construction of a double-walled lens to prevent water vapor condesation on the inner surface under conditions prevailing in sustained flight at very high altitudes and to delay such condensation in emergency loss of plane canopy or ejection in such a way as to provide unimpeded vision to the flier during the probable duration of the emergency or of free fall through the upper atmosphere. The limitations on weight and size of such a device, and the requirements of optical excellence, of outstanding resistance to thermal, abrasive, chemical, and radiation damage, and of feasibility of production at reasonable cost are obvious. Laboratory tests at Wright Air Development Center appear to have demonstrated the general adequacy of the final samples submitted.

Springfield Coll., Mass.
PHYSIOLOGICAL AND KINESIOLOGICAL METHODS FOR TESTING FOOTGEAR, by Peter V. Karpovich, Clifford E. Keeney and A. Allen Alexander. Rept. on Contract DA 19-129-qm-309. Jan 59, 103p. 4 refs. Footwear and Leather Series rept. no. 13.
Order from LC mi$5.70, ph$16.80 PB 140 252

The purpose was to develop methods for the evaluation of the effect of military footgear upon the function of the soldier. The following methods were tried: (1) measuring the energy cost of walking; (2) measuring and recording the bone alignment of the foot and lower leg; (3) determining the speed of sprinting 30 yards, the time of running a zig-zag course, and the height of vertical jumping; (4) measuring the pressure exerted on selected areas of the soles of the feet. Types of American, British and Canadian footgear were used. The difference in energy cost for different boots was not consistent. Study of the bone alignment showed that all types of footgear caused an average of 5° of supination. The functional insole caused 0.72° of supination more than the conventional. The 30-yard sprint showed no significant differences in the effects of different types of footgear. In the zig-zag run, there was a small but statistically significant difference in the effect of the various boot types. Several auxiliary devices and techniques were developed: (1) A device for locating the center of gravity of footgear. (2) A system of marking the leg and foot for measuring the degree of pronation or supination, from photographs taken of subjects wearing footgear with transparent plastic uppers. (3) A device called an inclinator was developed for obtaining a desired degree of pronation or supination.

Cornell U., Ithaca, N. Y.
A STUDY OF REFLECTED XENON IONS FROM PLATINUM, by Donald S. Beers. Technical rept. no. 10 on Theoretical and Experimental Investigations of the Atomic Phenomena Occurring on and near the Surfaces of Solids, Contract AF 18(600)674. 1 Mar 59, 66p. 15 refs. AFOSR TN-59-151; AD-210 985.
Order from LC mi$3.90, ph$10.80 PB 140 620

In the course of surface studies with the mass spectrometer, it has been observed that a considerable fraction of the ions removed from a surface by ion bombardment are of the same species as those in the bombarding ion beam. These ions are usually referred to as reflected ions. Reflected ions have been observed in other works dealing with the ionic bombardment of surfaces. There is very little information available on the properties of reflected ions, and, in the work that has been done, there are several discrepancies. This study to determine the characteristics of xenon ions reflected from a platinum surface was undertaken in the hope of improving our understanding of the nature of reflected ions.

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
SLOW WAVE PROPAGATION IN PLASMA WAVEGUIDES, by A. W. Trivelpiece. Technical rept. no. 7 on Contract Nonr-220(13). May 58, 145p. 28 refs.
Order from OTS $2.75 PB 151 638

It is shown that the space charge wave modes of propagation which are usually associated with the drifting motion of an electron beam can also propagate and carry energy in stationary electron beams or plasmas of finite transverse cross section. The properties of these modes of propagation have been studied by considering the plasma as a dielectric and solving the field equations. The effect of d.c. magnetic fields have been included, while ion motion and thermal velocities have been neglected. These modes have phase velocities which are generally much less than the velocity of light. Two distinct types of propagation are reported; the first involves charge density variation within the plasma (body wave) and the second involves a perturbation of the surface of the plasma (surface wave). Both of these types have modes which exist down to zero frequency as well as backward wave modes. The angular dependent modes can exhibit Faraday rotation. One of the potentially useful features of these modes of propagation is that of plasma diagnostics. The effect of radial charge density variation within the plasma column has been investigated and methods for experimentally determining this variation, as well as the average charge density, are suggested. The effect of collisions on wave attenuation is examined approximately. The interaction of a moving electron beam with these modes is considered, as well as the backward wave start oscillation conditions for backward wave interaction. A qualitative explanation of these modes is given in terms of an equivalent electrical circuit transmission line. Many of the features of these modes have been verified experimentally by measuring the phase velocity along a mercury arc discharge column in an axial magnetic field.

Plasmadyne Corp., Santa Ana. Calif.
ARGON MOLLIER CHART, by Gordon L. Cann and Adriano C. Ducati. Technical note no. 3 on Contract AF 49(638)54. 27 Feb 59, 22p. 2 refs. P-3TN029-35; AFOSR TN-59-247; AD-212 227.
Order from LC mi$2.70, ph$4.80 PB 140 223

Argon has recently been used extensively in shock-tube and arc plasma studies where the temperature is high enough to cause an appreciable per cent of ionization. Any analysis of the results then requires some extensive calculations to determine the state of the gas. In most cases the calculations neglect the effect of electronic excitation by using the Saha equation. In order to eliminate the errors introduced by this assumption and to have available the maximum amount of information about the gas properties, it was decided to construct a Mollier Chart. The chart covers the temperature range from 1000°K to 14,000°K and the pressure range from 10 atmospheres to 10^{-4} atmospheres.

Acoustics

Bolt, Beranek, and Newman, Inc., Cambridge, Mass
OFFICE NOISE STUDIES AT HILL AIR FORCE BASE, by Leo L. Beranek. Rept. on Acoustic Energy Control, Contract AF 33(616)2151. Aug 56, 72p. 11 refs. WADC Technical note 56-58; AD-110 645.
Order from LC mi$4.50, ph$12.30 PB 140 722

A questionnaire composed of 15 rating scales was administered to 190 people scattered over 17 different locations. The rating scales allowed the workert to assess such things as the "noisiness" of their environment and to appraise the effect of noise on various aspects of their work, such as their ability to converse or to use the telephone. The correlations provide a basis for setting "speech interference level" (SIL) criteria for the maximum noise acceptable in terms of SIL and of loudness level. These results, plus those from a previous study made in commercial offices, suggest that the maximum continuous noise levels acceptable for office spaces in which speech communication is important should not exceed an SIL of 40 db. Thus, with an SIL of 40 db the loudness level should preferably not exceed about 62 phons. Only under special conditions with this SIL would it be advisable to exceed a loudness level of 70 phons.

Control Systems Lab., U. of Illinois, Urbana.
EXPERIMENTAL STUDY OF THE AUDITORY DETECTION IN NOISE OF SIGNALS OF RANDOMLY VARYING FREQUENCY, by C. W. Sherwin, John J. Kovaly and others. Rept. on Contract DA 36-039-sc-56695. 1 July 55, 18p. 4 refs. Rept. R-72; AD-138 177.
Order from LC mi$2.40, ph$3.30 PB 136 019

This investigation related to certain aspects of the errors made by the human auditory system in an ex-

perimental signal detection situation roughly comparable to a situation that might be proposed as a test of signal detection apparatus. It was concerned with detection in noise of (1) signals which occur randomly in time but are of the same frequency, in comparison to (2) signals which also occur randomly in time but vary in frequency. In the first division of the experiment the sigle frequency. In the first division of the experiment the single frequency used was 800 cps; in the second division 20 frequencies, ranging from 300 to 1290 cps, were used; the total numbers of stimuli were equal in the two divisions. It is found that there is a degradation in detectability in going from single frequency to multiple frequency listening experiments. This degradation is in agreement with the behavior of a model of the auditory system consisting of a bank of contiguous narrow filters each as wide as a critical band, and each followed by a low pass filter.

Max-Planck-Institut für Strömungsforschung (Germany).
THE SCATTERING OF SOUND BY A SINGLE VORTEX AND BY TURBULENCE, by Ernst-August Müller and Klaus R. Matschat. Rept. on Contract AF 61(514)1143. Jan 59, 52p. 19 refs. AFOSR TN-59-337; AD-213 658.
Order from LC mi$3.60, ph$9.30 PB 140 691

The results of the single-vortex theory are applied to scattering by turbulence. The turbulent flow is represented by statistically distributed vortices. Both isotropic and extreme non-isotropic turbulence is considered. The total scattering power turns out to be proportional to the 5th or 2nd power of the frequency of the incident sound wave, depending on whether the frequency is low or high. The theoretical predictions are well confirmed by the measurements reported in Sec. 10. The results are applied to scattering by atmospheric turbulence.

Electricity and Magnetism

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE LOW TEMPERATURE THERMAL MAGNETO-CONDUCTIVITY IN FERRIMAGNETIC CRYSTALS, by D. Douthett (Doctoral thesis) and S. A. Friedberg. Technical rept. no. 3 on Contract Nonr-760(05). 10 June 58, 110p. 47 refs.
Order from LC mi$5.70, ph$16.80 PB 140 387

The thermal conductivities of single crystal bars of several ferrites have been measured over the temperature range 1.4° to 25°K in both zero external magnetic field and in a field of about 10 kilo-oersted. The experimental results are interpreted on the basis of the assumption that the heat current is primarily a phonon current limited by phonon-spin wave scattering.

Case Inst. of Tech., Cleveland, Ohio.
CONFORMAL MAPPING SOLUTION FOR EQUIVALENT RELATIVE PERMITTIVITY OF AN ARTIFICIAL STRIP DIELECTRIC MEDIUM, by N. Kolettis. Scientific rept. no. 2 on Contract AF 16(604)3887. 15 Jan 59, 29p. 8 refs. AFCRC TN-59-162; AD-213 097.
Order from LC mi$2.70, ph$4.80 PB 140 639

In this paper the exact solution for the equivalent relative permittivity (relative dielectric constant) ϵ'_s of a special kind of strip dielectric medium is derived. The method applied is the so called electrostatic one, employing multistage conformal mapping and the results obtained are valid for static or, quasi-static cases, i.e., for wavelengths large compared with the medium lattice dimensions. Results obtained from the exact solution have been plotted in a family of curves covering typical ranges of the variables involved. An approximate algebraic solution for ϵ'_s (very easy to evaluate !) under certain limiting conditions has also been derived and compared to the exact one.

Michigan U. Research Inst., Ann Arbor.
MAGNETIC PROPERTIES OF POLYCRYSTALLINE MATERIALS, by D. M. Grimes, R. D. Harrington and A. L. Rasmussen. Technical rept. no. 8 on Contract AF 18(603)8. Feb 59, 41p. 21 refs. 2495-13-T; AFOSR TN-59-272; AD-212 706.
Order from LC mi$3.30, ph$7.80 PB 140 777

The variation of the magnetic Q with internal magnetization in ferromagnetic materials is discussed using both the domain rotation and the domain-wall motion model of magnetization change. The variation of the reversible susceptibilities with magnetic moment is reported on four samples, and the results are compared with results from the frequency spectra in the initial and remanent states. The distribution of magnetic moments in the system as a function of angle between individual and averaged moments is discussed in terms of an infinite series expansion in Legendre polynomials. The coefficients of the first four terms can be measured. Experimental data are given for the first three.

Laboratory for Magnetic Research, Carnegie Inst. of Tech., Pittsburgh, Pa.
THE MAGNETIC SUSCEPTIBILITY OF SOME DILUTE ALLOYS OF NICKEL IN COPPER AND MAGNESIUM IN LITHIUM, by Emerson Wm. Pugh. Doctoral thesis. Technical rept. no. 7 on Contract N7onr-30307. Aug 56, 109p. 60 refs. AD-134 047
Order from LC mi$5.70, ph$16.80 PB 136 060

The magnetic susceptibilities of pure copper and dilute copper-nickel alloys containing 0.59-, 1.16-, and 2.48-at.-% nickel were measured by the Gouy method between 300° and 2.4°K. The anomalous temperature dependence previously reported for similar alloys was not observed. Susceptibility measurements made on lithium are compared with recently obtained spin resonance values of the conduction electron paramagnetism. Good agreement is indicated between the experimental susceptibility values and values calculated by D. Pines (Phys. Rev. 95:1090, 1954). Susceptibility measurements on some lithium-magnesium alloys indicate no anomalously large diamagnetic contribution with increasing magnesium content.

Naval Ordnance Lab., White Oak, Md.
EFFECTS OF EXTREMELY HIGH TEMPERATURES ON MAGNETIC PROPERTIES OF CORE MATERIALS, by Michael Pasnak and R. H. Lundsten. 10 July 58 60 p. NAVORD rept. 6132.
Order from OTS $1.75 PB 151 432

Magnetic properties of the following ferromagnetic alloys: Orthonol, 4-79 Mo Permalloy, 4750 AEM, L and Z Silectron, Transformer A, Audio Transformer A, 11.7 Alfenol, 15.5 Alfenol, 3% Mo Thermenol, 7-70 Perminvar, and Supermendur, for the temperature range of 24°C to 800°C. Grain oriented materials were more affected by temperature cycling than were unoriented materials. The effects of temperature cycling on the magnetic properties generally appear as an increase in the coercive force with each temperature cycle, a decrease in the maximum permeability, a decrease in the residual flux density, and a decrease in the squareness ratio.

Molecular Physics and Spectroscopy

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
MOLECULAR STRUCTURE AND INFRARED SPECTRUM OF NITROTRICHLOROMETHANE, by Alexander H. Castelli. Aug 58, 16p. 17 refs. Technical rept. 2537.
Order from LC mi$2.40, ph$3.30 PB 135 939

The infrared spectrum of nitrotrichloromethane (NTCM) has been observed in the 5000-660 cm^{-1} region. A vapor infrared spectrogram of a 100-cm path of NTCM has been obtained. Twenty-eight heretofore unreported infrared bands have been found. It is shown that these bands can all be interpreted in terms of fundamental assignments based on C_{2v} symmetry. In this manner, 4 bands are assigned to overtone species and the other 24 are assigned to combination bands. A calculation of the moments of inertia of NTCM indicates that previously reported conclusions concerning the infrared absorbance band contours of this molecule must be revised. The partition function for the internal rotation of NTCM is 0.346 $\sqrt{T}$. The manner in which the subsymmetries and C_s and C_{3v} of the nitro and trichloro group, respectively, contribute to the overall C_{2v} point group symmetry is discussed in some detail. All of the observed infrared absorbance spectrum of NTCM is explained.

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 29 on Contract Nonr-1841(34). 15 July 58, 41p. 25 refs.
Order from LC mi$3.30, ph$7.80 PB 140 592

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Palmer Physical Lab., Princeton U., N. J.
INVESTIGATION OF THE EFFECT OF GAS COLLISIONS AND OPTICAL PUMPING ON THE BREADTH OF SPECTRAL LINES: MICROWAVE ATOMIC OSCILLATOR USING THE HYPERFINE TRANSITION OF Rb^{87}, by T. R. Carver and R. H. Dicke. Quarterly rept. nos. 1-3, 1 Sep 55-31 May 56, on Contract DA 36-039-sc-70147. 3 nos.
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Quarterly rept. no. 3, 1 Mar-31 May 56, 6p. mi$1.80, ph$1.80, PB 140 290

Palmer Physical Lab., Princeton U., N. J.
INVESTIGATION OF THE EFFECT OF GAS COLLISIONS AND OPTICAL PUMPING ON THE BREADTH OF SPECTRAL LINES: MICROWAVE ATOMIC OSCILLATOR USING THE HYPERFINE TRANSITION OF Rb^{87}, by T. R. Carver and N. S. VanderVen. Quarterly rept. nos. 5-7, 1 Sep 56-30 May 57, on Contract DA 36-039-sc-70147. 3 nos.
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Quarterly rept. no. 7, 1 Mar-30 May 57, 8p. mi$1.80, ph$1.80, PB 140 294
(See also PB 140 288-PB 140 290)

Optics

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
TRANSITION PROBABILITIES FOR O_2 RADIATION IN THE NEAR ULTRAVIOLET, by Walter H. Wurster and Charles E. Treanor. Rept. on Contract AF 49(638)269. Aug 58, 24p. 7 refs. Rept. no. QM-1209-A-1; AFOSR TN-58-616; AD-162 145.
Order from LC mi$2.70, ph$4.80 PB 140 457

Spectroscopic shock tube experiments are described, showing the dominant role of the Schumann-Runge land system of oxygen in determining the ultraviolet absorptive properties of high-temperature air (2500 - 4500°K). The absorption by pure oxygen in this temperature range has been investigated at high resolution, and measured oscillator strengths for the (0, 13) and (0, 14) bands are presented.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INFRARED SOURCES, by William J. Fry, H. L. Van Velzer and Floyd Dunn. Progress rept. no. 2, 18 Feb-24 May 49, on Contract W33-038-ac-21811. 24 June 49, 18p. ATI-57 149.
Order from LC mi$2.40, ph$3.30 PB 140 173

The theory for obtaining radiation from a pulsed beam of charge has been under development. The problem of calculating the radiation field for such a beam of charge passing through a hole in a perfectly conducting plate has been studied. In order to simplify the situation, this initial approach has not even attempted to satisfy the proper boundary conditions at the plate but has proceeded with just a calculation of the magnetic potential at the plate due to the pulsed beam. The tube construction has proceeded rather slowly. Construction of the low-voltage and the high-voltage pulsers has been started.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INFRARED SOURCES, by William J. Fry, H. L. Van Velzer, and Floyd Dunn. Progress rept. no. 4, 18 June 48-30 Nov 49, on Contract W33-038-ac-21811. 24 Dec 49, 40p. 121 refs; ATI-72 402.
Order from LC mi$3.00, ph$6.30 PB 140 174

A survey was made of literature concerning infrared sources and existing methods for the generation of infrared radiation were evaluated. (See also PB 140 173)

Human Resources Research Office, George Washington U., Washington, D. C.
COMPARISON OF THE STEREOSCOPIC RANGE FINDER, M12 AND THE COINCIDENCE RANGE FINDER, T43 AS USED IN RANGE DETERMINATION AT NIGHT, by Melvin A. Schmitz, Edward A. Stark, and Norman Willard, Jr. Technical rept. 53 on [Contract DA 44-106-qm-1]. Apr 59. 27p. 13 refs.
Order from LC mi$2.70, ph$4.80 PB 140 522

The relationship between target illumination and the operation of the Internal Correction Systems of the two types of range finder in reducing bias was studied. Rangings were made on tank targets set at varying distances from the line of observation, by daylight and at night with the targets under two different conditions of illumination. Findings indicated the superiority of the coincidence range finder as the optical ranging device for use in tank gunnery at night.

Institute of Mathematical Sciences, New York U., N. Y.
ANNUAL SUMMARY REPORT: YEARLY STATEMENT OF ACCOMPLISHMENTS, by [Joseph] Rennert. Rept. for 1 Dec 56-30 Nov 57 on Contract Nonr-285(25) [1957] 5p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 136 750

The objective of this work is the exploitation of the persistent internal polarization phenomenon for information storage and infrared detection.

Institute of Mathematical Sciences, New York U., N. Y.
HOW DARK IS THE SHADOW OF A ROUND-ENDED SCREEN? by Joseph B. Keller. Rept. on Contract AF 19(604)1717. Oct 58, 11p. 4 refs. Research rept. no. EM-119; AFCRC-TN-58-589; AD-207 520.
Order from LC mi$2.40, ph$3.30 PB 140 531

The amplitudes of the fields in the shadows of two screens with rounded ends are determined as functions of b/λ. Here b denotes the radius of curvature of the end of the screen and λ denotes the wavelength of the normally incident plane wave. For one of the screens the amplitude decreases monotonically as b/λ increases when the field vanishes on the screen.

Institute of Optics, U. of Rochester, N. Y.
PHOTOCONDUCTIVITY IN KI AND RbI, by K. Teegarden. Technical note B 3 on Contract AF 49(638)433. 10 Apr 59, 21p. 9 refs. AFOSR TN-59-303; AD-213 087.
Order from LC mi$2.70, ph$4.80 PB 140 537

A threshold for photoconductivity has been observed in single crystals of KI at room temperature and RbI at room temperature and 203°K. This threshold occurs at a wavelength somewhat shorter than the position of the first fundamental band in both materials and is presumed to result from band to band transitions. No photocurrent is observed in the region of the first fundamental band in either KI or RbI.

Michigan U. [Research Inst.] Ann Arbor.
TWO INSTRUMENTS FOR MEASUREMENT OF OPTICAL PROPERTIES OF THE ATMOSPHERE, by B. S. Pritchard and W. G. Elliott. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. July 58, 34p. 13 refs. 2144-250-T.
Order from LC mi$3.00, ph$6.30 PB 140 301

A description is given of the design and construction of two instruments for studying atmospheric optics. One device, the Recording Polar Nephelometer, measures the volume scattering index of light passing through a sample of natural atmosphere, with scattering angle, polarization, and wave length as variables. A new calibration procedure has been developed which employs a diffusing screen of known reflectance and transmittance as the standard. The second device, the Portable Transmissometer, measures the attenuation coefficient with an accuracy of 5 per cent under all conditions. These instruments, when installed in a specially-equipped station wagon, form a mobile research unit. Samples of results obtained in fog and clear air are included.

Naval Research Lab., Washington, D. C.
COMPUTATION OF SINGLY SCATTERED RADIATION FROM A DISTANT SOURCE WHEN THE ANGULAR SCATTERING FUNCTION IS KNOWN, by J. W. Tucker. 13 Apr 59, 62p. 7 refs. NRL rept. 5260.
Order from OTS $1.75 PB 151 350

Knowledge of the volume scattering function and the extinction coefficient of a homogeneous scattering

medium allows computation of the singly scattered radiation from a point source that is incident on a receiver of specified field of view. If the source is isotropic within its field of projection and if source and receiver fields are symmetric about the line of sight, the numerical integration may be greatly simplified by making use of definite integrals computed along lines of constant polar angle. Such integrals have been computed, and the numerical values have been tabulated for use in computation. The technique for handling the axially symmetric problem has been developed in detail and is exemplified by data computed for comparison with available experimental results. A modified procedure for the problem of off-axis fields can be utilized in many practical cases.

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
A GRAPHICAL, COMPUTATIONAL METHOD FOR DETERMINING THE FOURIER TRANSFORM OF A FUNCTION, by Louis J. Free and Benjamin F. Cron. 10 Mar 58, 12p. USL Research rept. no. 379.
Order from LC mi$2.40, ph$3.30 PB 140 202

The method described can be use to determine the Fourier Transform of any pulse shape as a nearly continuous spectrum. The method is recommended as an outline for computer programming.

New York U. Coll. of Engineering, N. Y.
A POLARIZATION TECHNIQUE FOR SEEING THROUGH FOGS WITH ACTIVE OPTICAL SYSTEMS, by Alan M. Nathan. Final rept. for 1 Feb 55-31 Aug 56 on Contract AF 30(635)2821. June 57, declassified 26 Aug 57. 112p. 39 refs. Technical rept. no. 362.01; RADC TR-57-144; AD-131 239.
Order from LC mi$6.00, ph$18.30 PB 140 184

A polarization technique is described which effects striking improvements in visibility through fog, smoke, and haze when used at night with searchlight illumination systems. Targets normally undetectible can be clearly seen. The technique can be used with either visible or infrared radiation, and is applicable to image-forming or radiation-detecting active systems. A theoretical analysis is presented of the polarization properties of various types of scattering media, and it is shown that a Mie atmosphere (spherical particles) possesses specific properties which make the application of the polarization technique uniquely effective in reducing "noise in active optical systems.

Solid State Physics

Air Force Cambridge Research Center, Bedford, Mass.
A SURVEY ON SILICON CARBIDE, by M. Minamoto. Dec 58, 51p. 22 refs. AFCRC-TR-58-363; AD-208 159.
Order from LC mi$3.60, ph$9.30 PB 140 413

A survey of the literature and developments in silicon carbide including crystallographic, material, electrical, optical, and device aspects. The identity of silicon carbide as an extremely high-temperature semiconductor is established.

Armour Research Foundation, Chicago, Ill.
RESEARCH INVESTIGATION ON PURIFICATION OF MATERIALS FOR SYNTHETIC CRYSTAL GROWTH, by J. W. Cook. Rept. no. 3, 1 Feb-1 May 51, on Contract DA 36-039-sc-5459. 15 May 51, 23p. 5 refs.
Order from LC mi$2.70, ph$4.80 PB 140 651

During this period emphasis has been placed on purification of materials for growth of aluminum arsenate, chrysene, and phenanthrene crystals. A number of commercial materials have been analyzed to determine their applicability to production of orthoarsenic acid. A method is given for recrystallization which should give a reasonable yield of pure orthoarsenic acid, based on phase equilibria in the As_2O_5 - H_2O system. Commercial samples of chrysene and phenanthrene all proved to be very impure. Concepts of the cause of defective aluminum arsenate crystals are discussed from the viewpoint of their crystallographic origin. Best explanation appears to be the natural hemihedral structure with preferential adsorption and rejection of impurities.

Armour Research Foundation, Chicago, Ill.
RESEARCH INVESTIGATION ON PURIFICATION OF MATERIALS FOR SYNTHETIC CRYSTAL GROWTH, by E. J. Latos. Rept. no. 12, 1 Feb 51-31 Jan 52, on Contract DA 36-039-sc-5459. 22 Feb 52, 53p. 7 refs.
Order from LC mi$3.60, ph$9.30 PB 140 655

Purification of arsenic oxides for growth of aluminum arsenate and purification of chrysene.

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS AND MEASUREMENTS OF PROPERTIES OF SINGLE-CRYSTAL SILICON, by A. C. Beer. Final rept. on Contract AF 19(604)1852. 31 Mar 59, 29p. 31 refs. AFCRC-TR-59-125; AD-212 539.
Order from LC mi$2.70, ph$4.80 PB 140 634

Measurement techniques for evaluating the quality of silicon crystals included lifetime studies, as well as galvanomagnetic measurements. In certain p-type silicon specimens, a substantial variation in Hall coefficient with magnetic field was found at 80°K.

Bell Telephone Labs., Inc., New York.
SYNTHESIS OF QUARTZ CRYSTAL, by A. C. Walker and A. A. Ballman. Interim progress rept. no. 1. 1 Aug-30 Nov 54, on Contract DA 36-039-sc-64493. [1954] 49p.
Order from LC mi$3.30, ph$7.80 PB 140 663

20 "z" face seed plates, were grown to a total added weight of quartz of (8.4 pounds) in 30 days. Effort is being concentrated on an improved design of weld at the ends of the liner tubes, to permit a wider range of steels to be used for liners.

Bell Telephone Labs., Inc., New York.
SYNTHESIS OF QUARTZ CRYSTAL, by A. C. Walker A. A. Ballman. Interim rept. no. 2, 1 Dec 54-28 Feb 55, on Contract DA 36-039-sc-64493. 15 Mar 55, 17p.
Order from LC mi$2.40, ph$3.30 PB 140 662

Continuation of the program for demonstrating the reproducibility of the present method for growing quartz crystals. In smaller autoclaves, experiments have been carried out using lower temperatures and pressures. Clear, flawless growth has been obtained from basal-plane cuts at the fairly rapid rate of 0.040 inch per day. (See also PB 140 663)

Bell Telephone Labs., Inc., [Whippany, N. J.]
SYNTHESIS OF QUARTZ CRYSTAL, by A. C. Walker and A. A. Ballman. Interim rept. no. 3, 1 Mar-31 May 55, on Contract DA 36-039-sc-64493. 15 June 55, 39p.
Order from LC mi$3.00, ph$6.30 PB 140 661

During three experimental runs twenty quartz crystals were grown in each run to added weights of the order of 160 grams per crystal. The crystals grew at a rate of between 0.041 inch and 0.046 inch per day on the principal faces of the seeds, which were the minor rhombohedral faces of the natural quartz crystal. (See also PB 140 662)

Bell Telephone Labs., Inc., New York.
SYNTHESIS OF QUARTZ CRYSTAL, by G. T. Kohman. Final rept. for 1 Aug 54-30 June 55 on Contract DA 36-039-sc-64493. 31 Aug 55, 47p.
Order from LC mi$3.30, ph$7.80 PB 140 382

Previous studies of the synthesis of quartz had disclosed that higher rates of growth were possible at elevated temperatures and pressures but that specialized equipment was required to withstand the effects of the higher pressures and temperatures. The primary objective of the present contract was to explore the advantages to be gained by operating under these extreme conditions. Secondary objectives were to obtain basic information concerning hydrothermal synthesis of quartz and the effects of additives and other methods of altering the quality of synthetic quartz.

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, by H. E. Farnsworth, D. Haneman, and J. B. Marsh. Scientific rept. no. 10, 1 Dec 58-28 Feb 59, on Contract AF 19(604)1952. Mar 59, 18p. AFCRC-TN-59-151; AD-212 075.
Order from LC mi$2.40, ph$3.30 PB 140 638

Diffraction patterns from a (111) InSb surface are described. Measurements on recombination velocities at a germanium surface are reported.

California U., Los Angeles.
THE CRYSTAL STRUCTURE OF TETRACYANOETHYLENE, by D. A. Bekoe and K. N. Trueblood. Technical note no. 7 on Perchlorates, Contract AF 18(600)857. Jan 59, 27p. 36 refs. AFOSR TN-59-186; AD-211 326.
Order from LC mi$2.70, ph$4.80 PB 140 316

Tetracyanoethylene, $C_2(CN)_4$, (TCE) is a novel compound with many unusual chemical properties, which include the formation of strong colored molecular complexes with aromatic hydrocarbons. It is, in fact, the strongest π-acid known and forms a number of crystalline complexes. A precise determination of the structure of TCE was deemed of value not only for correlation with the properties of the molecule itself, but also to serve as a standard for comparison with the structure of TCE in its crystalline complexes.

California U., Los Angeles.
STUDIES OF THE STRUCTURES OF CRYSTALLINE PERCHLORATES AND RELATED SUBSTANCES, by K. N. Trueblood. Final technical rept. on Perchlorates, Contract AF 18(600)857. Jan 59, 20p. 17 refs. AFOSR TR-59-13; AD-210 387.
Order from LC mi$2.40, ph$3.30 PB 140 315

Investigations were conducted on crystal structures by x-ray diffraction techniques including (a) determination of x-ray diffraction patterns of lithium perchlorate trihydrate, anhydrous lithium perchlorate, silver perchlorate monohydrate, anhydrous silver perchlorate, and related substances, and also of simple molecular complexes (b) analysis of the x-ray patterns by means of three-dimensional Patterson or modified Fourier functions (c) work on new precise methods of structure refinement on high-speed computers.

Case Inst. of Tech., Cleveland, Ohio.
SINGLE CRYSTAL ELASTIC CONSTANTS OF LITHIUM, by H. C. Nash and Charles S. Smith. Technical rept. no. 24 on Contract Nonr-1141(03). July 58, 20p. 12 refs.
Order from LC mi$2.40, ph$3.30 PB 140 628

The elastic constants of single crystal lithium have been measured by the ultrasonic pulse-echo technique.

Chicago Development Corp., Riverdale, Md.
RESEARCH ON INTERSTITIAL SOLUTES IN METAL, by R. S. Dean and I. Hornstein. Final rept. on Contract AF 18(600)1458. Aug 58, 86p. 21 refs. AFOSR TR-58-127; AD-203 362.
Order from LC mi$4.80, ph$13.80 PB 136 737

Investigations were undertaken to rationalize in terms of free energy considerations the anodic refining of titanium alloys containing oxygen. Measurements of electrode potentials of zirconium-oxygen and titanium-oxygen confirmed and quantified the mechanism of these anodic reactions. Relationship of oxygen content to electrode potential has been shown to be useful as a control method for oxygen in titanium alloys, and to determine the diffusion of oxygen into titanium on heat treatment under various conditions.

Clevite Research Center, Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Quarterly rept. no. 7 for 15 Jan-14 Apr 58 on Contract DA 36-039-sc-72415. 14 May 58, 29p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 140 296

Studies of crystalline perfection of synthetic quartz specimens with double crystal X-ray monochromator indicate the following: (a) Differences in pickup of impurities were detected as areas differing in spacing or orientation in X-ray reflection pictures. (b) A substantial pickup of impurity is manifested in line broadening. (c) Some defects observed on X-ray reflection pictures are not correlated with changes in impurity content or observable features in the specimens. Experimental evidence is presented to support the conclusion deduced from crystal-growing theory that, when convection flow is limited as in small autoclaves, a reduction in crystallizing temperature eliminates fissure flaws in Z- and plus X-growth quartz.

Cornell U., Ithaca, N. Y.
THE DIFFRACTION OF ELECTRONS BY THIN FILMS, by S. H. Bauer. Final technical rept. on Contract Nonr-401(06). 1 Feb 58, 214p. 93 refs.
Order from LC mi$9.60, ph$33.30 PB 140 725

Contents:
Development of apparatus
The radial distribution method in electron diffraction, by K. P. Coffin
An evaluation of possibilities, by S. H. Bauer
Precise determination by electron diffraction of lattice parameters of polycrystalline specimens giving broad diffraction peaks, abstract, by G. G. Libowitz
Comments on the sampling process, by S. H. Bauer
Surface energies of microcrystallites; deductions from diffraction data, by Robert E. LaVilla
Transmission and scattering intensities of 50 K.V. electrons by thin collodion films, by Per Andersen and Crispin Calvo
Electron diffraction shape factor for a thin film, a theoretical analysis by H. Viervoll
Plural and multiple electron scattering in the 50 K.V. range, by H. Viervoll and Haakon Olsen
A study of the contract potential of evaporated metal films by a dynamic condenser method: the effects of oxygen and hydrogen on silver, copper and aluminum films, abstract by Howard L. Recht

Detroit U., Mich.
DEVELOPMENT OF A MATHEMATICAL THEORY OF PLASTICITY BASED ON THE CONCEPT OF SLIP, by H. Payne and S. J. Czyzak. Rept. on Contract AF 18(600)1466. 1 Oct 58, 44p. 9 refs.
AFOSR TN-58-779; AD-202 000.
Order from LC mi$3.30, ph$7.80 PB 140 791

The model for calculating the stress-strain relation due to Taylor is briefly reviewed in the introduction. The model is then extended, mathematically, to predict the complete stress-strain relation for a polycrystalline material following a non-linear strain path. From the development of this theory an application is made to the torsional problem.

Eagle-Picher Research Labs., Joplin, Mo.
FUNDAMENTAL STUDIES OF THE LEAD-OXYGEN SYSTEM, by E. J. Ritchie and R. G. Brockman. Annual rept. no. 4 (Final) for 1 Aug 57-31 July 58 on Contract Nonr 1513(00). [1958] 29p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 140 267

Reported herein are the results of series of lead oxide preparations and their resulting densities. Microscopical studies of flakes formed by the freezing of fused litharge show many small voids and much variation in visible structure. An electrolytic cell which can be mounted in an X-ray diffraction powder camera permits the direct study of electrode solid phase changes in situ while the cell is operating. Its use as a research tool in the study of lead dioxide anodes is demonstrated.

Eagle Picher Research Labs., Miami, Okla.
GROWING OF CADMIUM SULFIDE CRYSTALS FOR DOSIMETER PURPOSES, by J. E. Powderly and K. E. Bean. Final rept. for 17 Apr 57-15 July 58 on Contract DA 36-039-sc-73270. [1958] 82p. 6 refs.
Order from LC mi$4.80, ph$13.80 PB 138 213

Cadmium sulfide single crystals can be obtained by a sublimation-condensation process in a helium atmosphere with crystal deposition on polished clear silica plates. The optimum temperature conditions for successful growth are (a) seeding temperature of 1350°C for one hour and a growth temperature of 1200°C (approximately 100 hours). The temperature should not vary more than ± 2°C. Cadmium sulfide crystals produced by this process and having dark resistivities in the range of 5×10^7 to 5×10^8 ohm-cm are in every case sensitive to gamma rays. The heat treatment of this crystal also markedly increased the sensitivity to gamma rays.

Eagle-Picher Research Labs. [Miami, Okla.]
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 1, 1 May-1 Aug 55, on Contract DA 36-039-sc-64694. [1955]. 29p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 136 614

Phase I includes studies of single crystal germanium-silicon (10 atomic %) alloys prepared by horizontal growth methods, Phase II concerns preparation of germanium-silicon alloys by co-deposition from the vapor phase. Films of pure silicon, germanium, and germanium-silicon alloys were compared, and specific conductivity of each type of film as a function of temperature was investigated.

Eagle-Picher Research Labs. [Miami, Okla.]
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 2, 1 Aug-1 Nov 55, on Contract DA 36-039-sc-64694. [1955] 25p. 5 refs.
Order from LC mi$2.70, ph$4.80 PB 136 615

Contents:
Preparation of single crystal germanium-silicon alloys
Chemistry of trichlorosilane and silicon tetrabromide
Hydrogen reduction of trichlorosilane and silicon tetrabromide
Studies of tantalum silicide
(See also PB 136 614)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 3, 1 Nov 55-1 Feb 56, on Contract DA 36-039-sc-64694. [1956] 26p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 136 661

Contents:
Studies of trichlorosilane, with preparation of elemental silicon thereform
Reduction with molecular hydrogen at elevated temperatures
Deposition on quartz, apparatus
Spectrochemical data on the silicon
Microscopic studies of silicon deposits
Electrical characteristics
Deposition on porcelain
Hydrogen glow discharge
Apparatus & equipment
Data tables
Preparation of germanium-silicon alloys
(See also PB 136 615)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 4, 1 Feb-1 May 56, on Contract DA 36-039-sc-64694. [1956] 25p. 2 refs.
Order from LC mi$2.70, ph$4.80 PB 136 662

Contents:
Purification of silicon and silicon halides
Zone refining apparatus
Table of resistivities of zoned silicon
Chemical purification
Reduction of silicon halides
Crystal structure of silicon deposited from various halides
Effect of ratio of reactants
Deposition on quartz filaments
(See also PB 136 661)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 5, 1 May - 1 Aug 56, on Contract DA 36-039-sc-64694. [1956] 31p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 136 663

Contents:
Dross formation in silicon prepared from $SiHCl_3$.
Composition and structure of the dross.
Cause of dross formation.
Thermal dissociation of $SiHCl_3$.
Tantalum in silicon.
Determination of the amount of tantalum in silicon when deposition is carried out on tantalum.
Effectiveness of zone refining in the removal of tantalum.
Boron in silicon.
Present boron level in silicon.
Methods of decreasing the boron content.
(See also PB 136 662)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil and W. E. Medcalf. Quarterly rept. no. 6, 1 Aug-1 Nov 56, on Contract DA 36-039-sc-64694. [1956] 39p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 136 664

Contents:
Studies of trichlorosilane
Thermal decomposition, atmospheric pressure
Thermal decomposition at reduced pressure
Dross formation
Studies of silicon tetrachloride
Crystalline growth
Purification
Elemental silicon, from $SiCl_4$
Impurity concentration in
Heat treating studies
(See also PB 136 663)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by Robert K. Reil, K. E. Bean and W. E. Medcalf. Quarterly rept. no. 7, 1 Nov 56-1 Feb 57, on Contract DA 36-039-sc-64694. [1957] 39p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 136 665

Contents:
Studies of trichlorosilane ($SiHCl_3$)
Effects of a trace of n-pentane
Effect of filament temperature and molar concentration of reactants
Effect of traces of hydrocarbons and carbon monoxide in hydrogen, method of removal
Purification studies of $SiCl_4$
Heat treating studies
(See also PB 136 664)

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by K. E. Bean, R. K. Reil and W. E. Medcalf. Final quarterly rept. for 1 Feb-1 May 57 on Contract DA 36-039-sc-64694. [1957] 41p. 5 refs.
Order from LC mi$3.30, ph$7.80 PB 136 666

Contents:
Purification of $SiHCl_3$ by absorption techniques
Study of the purity of water and its effect on silicon
Hydrogen reduction of $SiHCl_3$
Floating zone studies
Silicon tetrachloride, purification by fractional distillation. Activation Analysis of Silicon produced by hydrogen reduction of silicon tetrachloride
reduction of silicon tetrachloride
Heat treatment studies on P-type and N-type single crystals
(See also PB 136 665)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
EFFECT OF HEAVY DOPING ON THE DIFFUSION OF IMPURITIES IN GERMANIUM, by M. W. Valenta. Technical note no. 3 on Contract AF 18(600)1310. July 58, 58p. 33 refs. AFOSR-TN-58-835; AD-202 920.
Order from LC mi$3.60, ph$9.30 PB 140 400

The diffusion coefficients of indium (In^{114m}), antimony (Sb^{124}), arsenic (As^{76}) and tin (Sn^{113}) were measured in As-doped, intrinsic and Ga-doped germanium over a temperature range of from 750 to 875°C. Antimony, arsenic and tin were diffused into the three types of germanium from a very thinly deposited surface layer of the corresponding tracers, while indium was diffused into the bulk by maintaining the germanium samples in the vapor of the indium tracer.

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge.
DRIFT MOBILITY OF CHARGE CARRIERS IN GERMANIUM AT HIGH PRESSURES, by Arthur C. Smith. Technical rept. no. HP-2 on Contract Nonr-1866(10). 15 June 58, 125p. 20 refs.
Order from LC mi$6.30, ph$19.80 PB 140 386

The results of measurements of the drift mobility of holes and the resistivity of p-type germanium at various temperatures as a function of pressure are presented. It is concluded that the change in resistivity with pressure of p-type germanium is consistent with a change of the mobility of holes with pressure.

Harvard U., Cambridge, Mass.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. no. 4, 30 Apr-30 July 52, on Contract DA 36-039-sc-15350. [1952] 138p. 140 refs.
Order from LC mi$6.90, ph$21.30 PB 140 593

Summarizes the work done in the first year of the contract. A precision study of the indices of refraction of five selected quartz samples, for the purposes of investigating the variation therein, determining the effect of irradiation on the indices, a study of the unit cell dimensions, the rate of solution of irradiated quartz, the temperature stability of the smoky color, the luminescence of quartz, the high-low inversion temperature, and the chemical composition. Indices of refraction and density are believed to be primarily associated with variation in the chemical composition of quartz through isomorphous substitution, chiefly of Al, Fe, Ti, Na and Si. The irradiation response is linked to this compositional variation.

Harvard U., Cambridge, Mass.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. on. 5, 30 July-30 Oct 52, on Contract DA 36-039-sc-15350. [1952] 9p.
Order from LC mi$1.80, ph$1.80 PB 140 594

Calibration and adjustment of two new high-precision x-ray powder cameras developed for the measurement of the unit cell dimensions of quartz; the design and construction of equipment for the precision measurement of the indices of refraction of crushed grains of quartz by the immersion method; and the precision measurement of the density of quartz. (See also PB 140 593)

Harvard U., Cambridge, Mass.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. no. 6, 30 Oct 52-30 Jan 53, on Contract DA 36-039-sc-15350. [1953] 8p.
Order from LC mi$1.80, ph$1.80 PB 140 595

Precision back-reflection x-ray camera calibration work using NaCl and ThO_2 as test substances was completed. A precision of about 1 part in 30,000 is obtained. (See also PB 140 594)

Harvard U., Cambridge.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. no. 7, 30 Jan-30 Apr 53, on Contract DA 36-039-sc-15350. [1953] 4p.
Order from LC mi$1.80, ph$1.80 PB 140 650

Continuation of routine precision measurements of the unit cell dimensions of quartz samples, and with index of refraction measurements by the new immersion technique. (See also PB 140 595)

Honeywell Research Center, Hopkins, Minn.
THE FORMATION OF CRACKS IN MAGNESIUM OXIDE SINGLE CRYSTALS, by R. J. Stokes, T. L. Johnston and C. H. Li. Technical rept. no. 1 on Contract Nonr-2456(00). July 58, 20p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 140 420

Experimental evidence is presented which lends direct support to the Stroh mechanism for crack formation. After a magnesium oxide crystal was compressed about 3%, it was observed that minute cracks had been formed in the region of a kink band generated by non-homogeneous plastic strain.

Horizons, Inc., Cleveland, Ohio.
RESEARCH ON THE DELAY TIME STUDY ON METAL SINGLE CRYSTALS, by R. H. Baskey. Final rept. on Contract Nonr-1876(00). 1 July 58, 76p. 26 refs.
Order from LC mi$4.50, ph$12.30 PB 140 439

Using single crystals of beta brass, zinc, and magnesium, the critical resolved shear stress increases rapidly at temperatures below room temperature, and with decreasing short strain durations of the order of 10^{-3} seconds.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
EFFECT ON SUPERCONDUCTIVITY OF AN INTERACTION BETWEEN CONDUCTION AND 4f ELECTRONS, by J. Peretti and A. A. Maradudin. Rept. on Contracts AF 18(600)1315 and AF 49(638)399. Mar 59. 69p. 14 refs. Technical note BN-166; AFOSR-TN-59-383; AD-214 010.
Order from LC mi$3.90, ph$10.80 PB 140 524

It has been found by B. T. Matthias and others that alloying lanthanum with the paramagnetic rare earth

metals decreases the superconductive transition temperature by an amount ΔT_c which depends on the concentration and the total spin of the solute atom. The same phenomenon occurs in the systems (Ce, PR)Ru_2 and (Ce, Gd)Ru_2. In this case an initial increase in the transition temperature is related to the change in the number of conduction electrons and consequently of the density of states at the Fermi level and the coupling constant V. Our object is to explain such a behavior by considering the Coulomb (direct and exchange) interaction of conduction electrons with the 4f inner electrons of the solute atoms. The result is that ΔT_c is nearly proportional to the solute concentration and depends on the total spin in a rather complicated way.

ITT Labs., Nutley, N. J.
RESEARCH ON GROWING CRYSTALS OF FERRIMAGNETIC OXIDES, by A. J. Marino, Jr. Scientific rept. no. 5, 1 Apr-30 June 58, on Contract AF 19(604)2261. July 58, 11p. 3 refs. AFCRC-TN-58-355; AD-160 797.
Order from LC mi$2.40, ph$3.30 PB 136 577

The flame fusion growth of crystals has been improved by two variations on electrical induction melting. The processes differ in the methods of material additions; the first, floating zone, uses solid rod, whereas the second, flameless fusion, employs powder feed.

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
INTERNAL PHOTOEFFECT AND EXCITON DIFFUSION IN CADMIUM AND ZINC SULFIDES, by M. Balkanski and R. D. Waldron. Rept. on Contract Nonr-1841(10). Nov 57, 45p. 18 refs. Technical rept. 123.
Order from LC mi$3.30, ph$7.80 PB 136 755

The spectral response of photoconductivity of ZnS and CdS for both single-crystal and sintered-powder samples was measured for several distances between the area of illumination and the electrode region. The energy transport process for indirect illumination was studied by measuring the photocurrent pulses produced by high intensity light flashes and by experiments with light transmission and electric fields. These studies demonstrate energy transport by electrically neutral entities other than photons, which we interpret as diffusion of excitons or mobile electron-hole pairs.

Liege U. (Belgium).
NOTES ON NUCLEAR QUADRUPOLE RESONANCE IN SOLIDS, by J. Duchesne. Technical scientific note no. 1 on Contract AF 61(514)1212. 1958, 33p. 27 refs. AFOSR TN-58-815; AD-202 638.
Order from LC mi$3.00, ph$6.30 PB 136 883

Contents:
Nuclear quadrupole resonance
  Valency questions
  Resonance intensity in mixed crystals
Research in radiation chemistry
  Analysis of the method
  Scope of research
  Radiation resistance to gamma-rays
Discussion of the results
Tentative interpretations of radiation resistance
Post-effects and oxygen effect
Neutron - irradiated sodium chlorate
Study of the broadening effect of resonance lines
General conclusions

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 25 on Contract N5ori-078(56). 15 July 57, 62p. 48 refs. AD-141 416.
Order from LC mi$3.90, ph$10.80 PB 136 172

Contents:
Matrix elements of symmetric operators, by G. F. Koster
Electron charge density in KCl, by L. P. Howland
Augmented plane wave method for iron, by J. H. Wood
Energy bands in potassium, by L. C. Allen
Configuration interaction calculation on the ground state of the hydrogen molecule, by H. A. Aghajanian
Correlation correction for OH, by A. C. Hurley and A. J. Freeman
An SCF calculation on the ground state of Li_2^+, by C. M. Moser
Electronic wave functions for the hydrogen fluoride molecule, by L. C. Allen
The hydrogen fluoride molecule, by A. M. Karo and L. C. Allen
Atomic wave functions, by R. E. Watson
Hartree-Fock solutions for F, F^-, and Ne, by L. C. Allen
Atomic calculations, by J. H. Wood
Multi-center integral programs for IBM 704 computer, by A. C. Switendick

Miami U., Coral Gables, Fla.
SURFACE STATES IN LINEAR CHAINS, by Harry A. Brown. Final technical rept. on Contract AF 49(638)62. Sep 58, 43p. 5 refs. AFOSR TR-58-128; AD-203 493.
Order from LC mi$3.30, ph$7.80 PB 136 736

The usual treatment of a perfect lattice involves two approximations: The lattice parameter is assumed to be the exact spacing between all neighbors and the lattice is assumed to be infinite in extent. Both of these restrictions are relaxed for special reasons; in particular, the effect of a surface requires the consideration of a finite lattice and, in actuality, the departure from a constant lattice parameter near the surface. In this report, the latter effect will be ignored and it will be supposed that even the surface atoms are the same distance from their neighbors as are the inner atoms.

Michigan U. Coll. of Engineering, Ann Arbor.
WHISKER GROWTH ON VANADIUM PENTOXIDE SURFACES, by V. J. Lee and G. Parravano. Rept. on Contract AF 49(638)493. Mar 59, 32p. 11 refs. 2832-1-T; AFOSR-TN-59-184; AD-211 324.
Order from LC mi$3.00, ph$6.30 PB 140 548

In open systems, whickers were found to grow by diffusion from the base, while evaporation was predominant at the top. Whiskers, which upon growing

on the surface of a vanadium pentoxide microsphere at uniform cross section, meet a neighboring sphere, grow suddenly in diameter. It is suggested that whisker formation represents the first stage of sintering of vanadium pentoxide particles.

Michigan U. Research Inst., Ann Arbor.
AN INVESTIGATION OF REACTIONS INVOLVED IN THE PREPARATION OF FERRITES, by Clinton F. Jefferson. Technical rept. no. 7 on Contract AF 18(603)8. Jan 59, 124p. 60 refs. 2495-12-T; AFOSR TN-59-218; AD-211 780.
Order from LC mi$6.30, ph$19.80 PB 140 623

The purpose of this study was to investigate some solid-state reactions involved in the preparation of ferrites. By means of microscopic examination of polished sections, chemical analysis, X-ray analysis, density measurements, and magnetic measurements such as the Curie temperature and saturation moment per gram, the phase relationships, kinetics of the spinel reaction in several different atmospheres, and the densification process have been studied in the systems (Ni, Zn)O-Fe_2O_3 and Li_2O-Fe_2O_3. Some magnetic properties of ferrites contained in the system $Ni_xZn_{1-x}Fe_2O_4$-Fe_2O_3 are correlated with the method of preparation. By differential thermal analysis, chemical analysis, and saturation moment measurements, the progression of the oxidation of the systems $Ni_{.474}Zn_{.526}Fe_2O_4$-$Fe_3O_4$ and $LiFe_5O_8$-Fe_3O_4 has been followed. The temperature at which γFe_2O_3, which forms during the oxidation of the above systems, transforms to αFe_2O_3 has been determined as a function of the composition.

Michigan U. [Research Inst.] Ann Arbor.
MEASUREMENT AND INTERPRETATION OF THERMAL AND MAGNETIC DATA ON NICKEL-ZINC FERRITES, by D. M. Grimes, E. F. Westrum, Jr. and others. Technical rept. no. 34 on Contract DA 36-039-sc-63203. Mar 57, 39p. 30 refs. 2262-141-T; AD-135 955.
Order from LC mi$3.00, ph$6.30 PB 140 340

Contents:
Heat capacities at low temperatures, entropy and enthalpy increments of four nickel zinc ferrospinels
Molecular field fluctuation effects in mixed nickel zinc ferrites
Low temperature heat capacity and thermodynamic properties of zinc ferrites

The heat capacity and the magnetic moment versus temperature of $Zn_xNi_{1-x}Fe_2O_4$ has been measured from about 4°K to 300°K where x = .9, .8, .7, and .6. The heat capacity has been measured over the same temperature range for Zn Fe_2O_4. An antiferromagnetic cooperative transition at about 9.5° K was observed in $ZnFe_2O_4$ which gradually becomes more rounded and contributes less entropy as x decreases. The magnetic moment decreases gradually with increasing temperature and for the larger values of x goes slowly towards zero. Predicted thermal effects due to triangular-ferrimagnetic transitions were not found.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMATION FOR SEMICONDUCTORS, by Philip Parzen. Quarterly rept. no. 8, 1 Apr-30 June 58, on Contract DA 36-039-sc-73052. 17 Sep 58, 16p. 2 refs. Rept. R-523.23-58; PIB-453.23.
Order from LC mi$2.40, ph$3.30 PB 140 596

The transmission line method of band structure computation requires an accurate knowledge of the scattering coefficients T_{ji}. An alternative derivation of the T_{ji} by a variational method is given in this quarterly report. The resultant equations appear to be simpler than those used previously as they involve fewer unknowns. In addition, the variational formulas can be used to obtain quick rough answers. Symmetry properties of the $t_{\mu\nu}$ are also derived, which simplify the equations considerably.

Minneapolis U., Minnesota.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 2, 1 Mar-15 June 51, on Contract DA 36-039-sc-5419.. [1951] 13p.
Order from LC mi$2.40, ph$3.30 PB 140 770

Fourteen new experiments are reported. Nine of these investigate the influence on twinning and growth of relatively small temperature differentials (measured at c. 30°C). Conflicting results are obtained with a bottom-of-bomb temperature of near 385°C where Brazil twinning is found in the top crystal of three of the experiments and is completely absent in four. With a bottom-of-bomb temperature of 400°C and similarly small temperature differential, Brazil twinning persists in the top crystal. Four experiments were made with the intermediate dimension of BT plates oriented vertically (c crystallographic axis horizontal) exposing the very narrow edge (.02 inches) of the plate at the top. In two additional experiments the middle plate (of three) was suspended with largest dimensions horizontal (top and bottom plates with intermediate dimension vertical) to offer a large surface at a low level in the bomb to settling particles. (See also PB 140 799)

Minnesota U., Minneapolis.
STUDIES OF $AlPO_4$ (BERLINITE) AND QUARTZ CRYSTALS WITH RESPECT TO CAUSES AND ELIMINATION OF TWINNING, by John W. Gruner and Lynn Gardiner. Final rept. for 1 Dec 48-30 Nov 50 on Twinning Studies of Quartz Type Structures, Contract W36-039-sc-32006. [1950] 65p.
Order from LC mi$3.90, ph$10.80 PB 140 285

Brazil twinning has been observed in experiments which have been made with quartz in the temperature range from 305° to 405°C. All twinning is found on seeds which are farthest from the hot end of the bomb, in which supersaturation reaches a maximum. Twinning does not occur below about 375°C. Increasing pressures speed up growth somewhat but not in proportion to the additional cost and work involved.

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 3, 15-Sep-15 Dec 51, on Contract DA 36-039-sc-5419. 29 Feb 52, 3p.
Order from LC mi$1.80, ph$1.80 PB 140 769

Little progress reported. (See PB 140 770)

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly rept. no. 4, 16 Dec 51-15 Mar 52, on Contract DA 36-039-sc-5419. [1952] 14p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 140 768

Sixteen new experiments were made (Tables I to IV). In most of them complex twinning developed in the crystals which were at or close to the interface of liquid and gas as in the experiments described in the fire preceding progress reports. This twinning was carefully studied optically as well as on etched surfaces. It is believed that it was largely caused by steep temperature gradients and resulting turbulence. (See also PB 140 770)

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 6, 16 Sep-15 Dec 52, on Contract DA 36-039-sc-5419. [1952] 13p.
Order from LC mi$2.40, ph$3.30 PB 140 616

Sixteen new experiments are described. The experimental procedure differed from the experiments previously made principally in the manner in which the bombs were heated. In the new ones the base of the bomb rested on a 500 W chromalox ring heater resulting in an even gradient from bottom to top. The differential was controlled by varying the amount of insulation at the top. In ten of the experiments the desired pressure was established at room temperature with nitrogen and maintained by bleeding the gas as the temperature rose. Six experiments were conducted without the nitrogen, the pressure being produced by the expansion of the solution with rise in temperature and controlled by bleeding. Brazil twinning appears persistent in all experiments made in the bombs with deepest chamber (203 mm.) regardless of bottom temperatures (367-404°C). Brazil twinning did not develop in experiments in bombs 146 mm. deep when no nitrogen was introduced.

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 7, 16 Dec 52-15 Mar 53, on Contract DA 36-039-sc-5419. 1953, 10p.
Order from LC mi$1.80, ph$1.80 PB 140 617

Seven new experiments are described. The duration of the present runs was 9 to 19 days long to obtain larger crystals and to study the effect of increased growth on the twinning. Observations of the etched surfaces and in polarized light show both optical and electrical twinning in most of the crystals. A fine fibrous or streamer effect which appears to be due to optical twinning is persistent throughout.

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Final rept. for 1 Dec 50-30 June 53 on Contract DA 36-039-sc-5419. [1953] 66p. 14 refs.
Order from LC mi$3.90, ph$10.80 PB 140 615

About 100 experiments are listed and described in this report. All except those which failed early in the run have been tabulated. Three notebooks accompany this final report. They contain such detail of each experiment which could not be included without obscuring the results. More than 50 photomicrographs were taken of which 12 are reproduced. The others are available if required. All experiments were made under controlled pressure and temperature. In most of them a nitrogen gas phase was present, but in about 30, liquid and solid were the only phases. Two different types of furnaces were used resulting in two kinds of temperature gradients which produced results of considerable significance. Electrical and complex optical twinning was present in many products. While this study has led to a considerable number of conclusions, these are in part tentative as in most scientific work. If larger scale equipment could be employed chiefly for twinning studies, it is believed that most of our conclusions could be confirmed. (See also PB 140 616)

New Jersey Ceramic Research Station Rutgers U., New Brunswick.
THE GROWTH AND STUDY OF FERROMAGNETIC SPINEL SINGLE CRYSTALS, by W. H. Bauer, K. M. Merz, and P. D. Baba. Technical rept. no. 1 on Contract Nonr-404(02). June 58, 121p. 71 refs.
Order from LC mi$ 6.30, ph$19.80 PB 140 431

X-ray diffraction methods have been used to observe ferromagnetic domains by the double crystal diffractometer and x-ray micrograph techniques. There is a "d" spacing shift in the domain lines produced by the application of a magnetic field perpendicular to the original domain alignment. This "d" spacing shift was shown to agree in sign and magnitude with the result expected from magnetostriction to measurements on the cobalt zinc ferrite specimen. In magnetothermal annealed crystals a strain anisotropy was found which depended on the direction of specimen rotation. The domains observed by x-ray microscopy appeared to be thin sheets approximately 20 microns thick which entend through the crystal parallel to the (110) plane.

New York State Coll. of Ceramics, Alfred U.
DIFFUSION AND CONDUCTION IN IONIC SOLIDS, by Edward August Giess. Doctoral thesis. Rept. on Contract AF 18(600)1448. July 58, 121p. 112 refs. AFOSR-TN-58-910; AD-202 408.
Order from LC mi$6.30, ph$19.80 PB 136 768

Report contains a review of the literature with general theory. Experimental data was developed for cobalt diffusion into periclase (MgO) and considerable effort was expended on natural and synthetic sodium chloride with various impurities. These seemed essential for diffusion effects.

New York State Coll. of Ceramics, Alfred U.
SEMICONDUCTIVITY IN CADMIUM TELLURIDE, by John Leets Stull. Doctoral Thesis. Rept. on Contract Nonr-1503(01). July 58, 120p. 79 refs.
Order from LC mi$6.00, ph$18.30 PB 140 390

Hall coefficient and resistivity measurements were made in single crystals of CdTe, both "pure" and with added impurities, and in hot-pressed polycrystalline specimens. Anomalous changes in resistivity as a function of applied electric field and heat treatment in crystals containing both donors and acceptors were found and investigated.

Nuclear Science and Engineering Corp., Pittsburgh, Pa.
THE DETERMINATION OF SUBMICROGRAM QUANTITIES OF BORON IN HIGH PURITY SILICON METAL. Final rept. on Contract AF 19(604)1849. 19 May 58, 31p. AFCRC-TR-58-150; AD-152 422.
Order from LC mi$3.00, ph$6.30 PB 136 046

Reported are the results of a program undertaken to develop an activation analysis technique for the determination of boron in transistorgrade silicon in the parts per billion range. Because of the unexpectedly large amount of nitrogen in the silicon samples submitted for experimental purposes, the proton irradiation was not successful in determining the amount of boron. In the deuteron irradiations, the yield of the boron reaction is much greater than the yield from the nitrogen reaction $N^{14}(d, n\alpha)C^{11}$, and the boron was measurable.

Ohio State U. Research Foundation, Columbus.
THERMODYNAMICS OF BINARY INTERSTITIAL SOLID SOLUTIONS, by Joseph W. Spretnak. Rept. on Metallurgy of Boron in Iron and Steel, Contract AF 18(600)94. Dec 53, 25p. 7 refs. WADC Technical rept. 53-487; AD-28 988.
Order from LC mi$2.70, ph$4.80 PB 140 377

The thermodynamics of binary interstitial solid solutions is treated theoretically, taking into account strain energy and compound formation. It is shown that the interstitial solid solubility of the metalloids is less in body-centered cubic metals than in the close-packed metals, principally because of the greater strain energy in the former crystalline structures than the latter. As a consequence, the body-centered cubic crystalline phases are relatively less stable than the close-packed crystalline phases in binary alloys such as Fe-C, Fe-N, Ti-C, Ti-N, and TiO. The directions the solvus lines are explained by this concept.

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries, and E. F. Osborn. Quarterly progress rept. no. 1, 1 July-30 Sep 51, on Contract DA 36-039-sc-5594. 4 Oct 51, 38p. 19 refs.
Order from LC mi$3.00, ph$6.30 PB 140 191

Experimental work was begun with a study of the fluoride model systems $KF-MgF_2$ and $AgF-ZnF_2$, in order to investigate the existence of any simple relationships to either the structures or the phase relations within the system $BaO-TiO_2$. Progress was made in the systematic classification of mixed trivalent oxides, including the rare earths. From the compounds prepared the influence of ionic crystal radius ratio, polarizibility, and other factors may be deduced.

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Quarterly progress rept. no. 2, 1 Oct-31 Dec 51, on Contract DA 36-039-sc-5594. 10 Jan 52, 39p. 14 refs.
Order from LC mi$3.00, ph$6.30 PB 140 187

Progress has been made in determination of phase equilibrium in the systems $BaO-TiO_2$, $CaO-TiO_2-SiO_2$ and $BaO-TiO_2-SiO_2$. Several different types of mixtures with gels, oxides, glasses and natural minerals have been prepared and used in the investigation of the hydrothermal stability of the micas.

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 52, on Contract DA 36-039-sc-5594. 2 Apr 52, 12p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 140 448

Attempts have been made to synthesize a large number of compounds which may be expected to have a certain structure. Both hydrothermal and dry sintering and melting methods have been used to prepare these binary and ternary mixed oxides and hydroxides. Dielectric properties of certain of these structures are being measured. (See also PB 140 187)

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Quarterly progress rept. no. 5, 1 July-30 Sep 52, on Contract DA 36-039-sc-5594. 3 Oct 52, 17p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 140 194

Work on the systems: $CaO-TiO_2-SiO_2$, $BaO-TiO_2$ is nearing completion and work on the system $NaNbO_3-BaTiO_3$ is being initiated. Thermodynamic calculations were made to obtain an indication of the eutectic in the TiO_2-SiO_2 system. (See also PB 140 187)

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries, and others. Quarterly progress rept. no. 6, 1 Oct-31 Dec 52, on Contract DA 36-039-sc-5594. 12 Jan 53, 32p. 20 refs.
Order from LC mi$3.00, ph$6.30 PB 140 193

Investigations of the systems: $CaO-TiO_2-SiO_2$, and $BaO-TiO_2$, are nearing completion. The presence of immiscible liquids in the former system appears to cover a large area of the diagram and extend to the binary system TiO_2-SiO_2. Investigations of the sys-

tem $BaO-TiO_2-H_2O$, provide information on the possibilities of hydrothermal growth of $BaTiO_3$ crystals. Essentially complete p-t curves describing the equilibrium in the system $In_2O_3-H_2O$, have been obtained, and preliminary data in the system $Sc_2O_3-H_2O$ fail to show agreement with earlier work. (See also PB 140 194)

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park]
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Quarterly progress rept. no. 7, 1 Jan-31 Mar 53, on Contract DA 36-039-sc-5594. 13 Apr 53, 22p.
Order from LC mi$2.70, ph$4.80 PB 140 192

Investigations of the systems: $BaO-TiO_2$, $CaO-TiO_2$, TiO_2-SiO_2 and $CaO-TiO_2-SiO_2$ are essentially complete. Investigations have been initiated in the systems $SrO-TiO_2$, $CaTiO_3$ - $BaTiO_3$ and continued on the systems $BaTiO_3-SiO_2$ and $BaTiO_3-NaNbO_3$. Investigations of the stability of the hydroxides and oxyhydroxides with respect to temperature and pressure in the systems involving Cr_2O_3, Sc_2O_3 and In_2O_3 with water have been completed. The compositional and temperature limits of the formation of micas in systems with a large variety of ions is being studied. (See also PB 140 193)

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park]
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Quarterly progress rept. no. 10, 1 Oct-31 Dec 53, on Contract DA 36-039-sc-5594. 7 Jan 54, 23p. 7 refs.
Order from LC mi$2.70, ph$4.80 PB 140 195

Phase equilibrium studies have been continued on the systems: $CaTiO_3-BaTiO_3$, and $BaTiO_3-SiO_2$. Work on the hydrothermal synthesis of layer silicates has been continued extending our earlier work to 4 layer structures with Cr^{3+} (chlorites) and to disilicic micas with Ca^{2+} and Ba^{2+}. (See also PB 140 192)

Physical Metallurgy Lab., Calif. Inst. of Tech., Pasadena.
ALLOTROPIC TRANSFORMATIONS IN METALS, by Pol Duwez. Final technical rept. on Contract N6onr-24430. 31 July 58, 5p. 15 refs.
Order from LC mi$1.80, ph$1.80 PB 140 419

A list of titles (15) on allotropic transformations in titanium, hafnium, and other alloy systems.

Polaroid Corp., Cambridge, Mass.
SOME OPTICAL PROPERTIES OF TRANSPARENT SOLIDS, by Eugene S. Emerson. Final rept. on Contract N7onr-39102. 27 Apr 55, 57p. 38 refs. AD-65 021.
Order from LC mi$3.60, ph$9.30 PB 140 781

A summary is presented of the results of several studies of the optical properties of transparent solids, chiefly crystals of the isometric class. Attention was directed toward the stress-optic (photoelastic) behavior of these isotropic solids. A method based on the use of epitaxis (oriented overgrowth) was evolved to ascertain the crystallographic directions in the ingots. The plastic-optic effects in single crystals resulting from mechanical deformation were also studied along with the sometimes concomitant enhancement of the photolytic susceptibility. The photochemical changes were manifested in the spectral absorption features of the solid. Synthetic LiF and other synthetic fluorides were subjected to spectrophotometric analysis; explanations are advanced as to the presence or absence of the characteristic absorption notch at 2.8 μ. A discussion of the relationship between the absolute space configuration and the electro-optic (also piezoelectric) effects in the cubic ZnS crystal is presented along with a discussion of the Pockels solid CuCl for use as an electro-optic light valve or shutter. The number of crystalline materials being successfully synthesized suggests their use for IR optical elements such as polarizing prisms and birefringent phase shifters; these elements are discussed and illustrated.

Polytechnic Inst. of Brooklyn, N. Y.
SOLUTIONS OF SOME PROBLEMS IN STEADY CREEP, by B. Venkatraman. Rept. on Contract AF 18(600)1381. July 57, 125p. 41 refs. PIBAL rept. no. 402; AFOSR TN-57-388; AD-132 463.
Order from LC mi$6.30, ph$19.80 PB 140 613

The problems considered are trusses, beams and frames, a thick-walled tube subject to uniform internal pressure, pure torsion of prismatic and cylindrical bars, and circular plates under normal pressure. Some of the problems are analysed with the elastic analogue as basis, while others are based on a creep flow law formulated in quite similar terms to those of plastic flow.

Rome Air Development Center, Griffiss AFB, N. Y.
PREPARATION AND PROPERTIES OF CADMIUM SULFIDE PHOTOCONDUCTORS, by J. Graham, F. Keller and others. Dec 58, 24p. 55 refs. RADC-TN-58-308; AD-148 978.
Order from LC mi$2.70, ph$4.80 PB 138 786

Investigations indicated that the limitations on the photoconductor materials, especially the low speed of response, make them impractical at the present time for solid state display devices. However, there are other electro-optic applications for which this limitation is not as severe, for example, image converters, switches, and bistable elements for computer application. A general description is given of the solid state display cell, image converter, and the bistable element which utilizes an electroluminescent cell in combination with the photoconductor.

St. Louis U., Mo.
PHOTOELECTRIC SCHOTTKY DEVIATIONS FOR SINGLE TUNGSTEN CRYSTALS, by D. F. Stafford and A. H. Weber. Final Technical rept. for 1 Nov 55-30 Nov 58 on Further Investigation of Photoelectric Schottky Deviations for Tungsten, Molybdenum, and Tantalum, Contracts DA 23-072-ORD-(590, 885). 15 Jan 59, 38p. 22 refs. AD-209 535.
Order from LC mi$ 3.00, ph$6.30 PB 140 644

Emission from the (111) crystallographic planes of a tungsten single crystal grown in a filamentary cathode (cylindrical geometry) of 0.004 in. diameter wire. The experimental results agree in an overall way with the original photoelectric Guth-Mullin theory and the latest thermionic theory of Cutler-Gibbons.

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF $SbCl_5.POCl_3$, by Ingvar Lindqvist and Carl-Ivar Brändén. Technical note no. 3 on Contract AF 61(052)43. 12 Jan 59, 14p. 20 refs. AFOSR TN-59-154; AD-211 114.
Order from LC mi$2.40, ph$3.30 PB 140 399

The crystal structure of $SbCl_5.POCl_3$ has been determined from three-dimensional X-ray data. This is the first structure determination of an addition compound with an oxychloride functioning as donor molecule. The structure is built up of discrete $SbCl_5.POCl_3$ molecules. The coordination around Sb is octahedral with an O atom from $POCl_3$ in the sixth corner. The approximately tetrahedral structure of $POCl_3$ is preserved. The bond angle Sb-O-P is 143.7°. The structure is briefly discussed.

Watertown Arsenal Labs., Mass.
ORIENTATION SENSITIVITY OF ALPHA TITANIUM TO ELECTRO STAINING, by Ralph H. Hiltz, Jr. Rept. on Materials for Lightweight Construction. Feb 59, 11p. Technical rept. no. WAL TR 401/266; AD-210 867.
Order from LC mi$2.40, ph$3.30 PB 140 558

X-ray results showed that alpha titanium grains, oriented such that their basal plane was parallel to the polished surface, have a slower reactivity to stain etching than any other orientation.

Wesleyan U., Middletown, Conn.
PIEZOELECTRIC CRYSTAL STUDIES AND MEASUREMENTS, by Karl S. Van Dyke. Quarterly rept. no. 4, 1 Nov 53-31 Jan 54, on Contract DA 36-039-sc-42587. [1954] 12p.
Order from LC mi$2.40, ph$3.30 PB 140 258

Most of the progress of the year has been stated in three preceding volumes. The present volume includes a review of the distribution of emphasis upon the several phases by quarters.

Wesleyan U., Middletown, Conn.
PIEZOELECTRIC CRYSTAL STUDIES AND MEASUREMENTS, by Karl S. Van Dyke. Rept. no. 6 (Final) for 1 Feb 56-30 June 57 on Contract DA 36-039-sc-71154. 22 July 57, 121p. 11 refs.
Order from LC mi$6.30, ph$19.80 PB 137 107

A graphical and theoretical study of the modes of vibration in beveled quartz disks such as used for electronic frequency control and sharp cut-off wave filters. Topics discussed include: mathematical description of the vibrations of a circular plate, experimental observations on beveled and unbeveled disks, plate dimensions, determination of plate orientation, the relationship between local admittance and local strain, aberrations of an admittance pattern from a square at-cut plate.

X-Ray and Crystal [Analysis] Lab., Pennsylvania State [U.] [University Park].
X-RAY DIFFRACTION STUDIES OF PIEZOELECTRIC CRYSTALS, by R. Pepinsky. Quarterly progress rept. no. 1, 15 Nov 52-14 Feb 53, on Contract DA 36-039-sc-42598. [1953] 37p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 140 649

The chief instrumentation is in specialized X-ray diffraction equipment, static single-crystal studies over a range of temperatures, and involving precise X-ray intensity measurements. The X-ray studies provide information on the disposition of, and bonding between, atoms in the crystals, and how these are altered when the crystals become polarized.

X-Ray and Crystal [Analysis] Lab., Pennsylvania State [U.], [University Park].
X-RAY DIFFRACTION STUDIES OF PIEZOELECTRIC CRYSTALS, by R. Pepinsky, R. V. G. Sundara Rao and others. Quarterly progress rept. no. 3, 15 May-14 Aug 53, on Contract DA 36-039-sc-42598. [1953] 31p. 15 refs.
Order from LC mi$3.00, ph$6.30 PB 140 656

Progress of the X-ray analysis of the crystal transition in ammonium dihydrogen phosphate at 148°K is reported. Research continues on crystal structure of ferroelectric Rochelle Salt; and survey of new piezoelectrics is also continued.

X-Ray and Crystal [Analysis] Lab., Pennsylvania State U. [University Park].
X-RAY DIFFRACTION STUDIES OF PIEZOELECTRIC CRYSTALS, by R. Pepinsky. Final rept. for 15 Nov 53-14 Nov 54 on Contract DA 36-039-sc-42598. [1954] 78p. 13 refs.
Order from LC mi$4.50, ph$12.30 PB 140 657

A sensitive detector for piezoelectricity has been designed and constructed, which permits rapid surveying of known and new crystals for piezoelectric activity. Some results of the survey for new piezoelectric materials are presented. (See also PB 140 656)

Theoretical Physics

Columbia U., New York.
NOTE ON VIBRATIONS OF PRISMS AND POLYGONAL PLATES, by R. D. Mindlin. Technical rept. no. 29 on Contract Nonr-266(09); Interim rept. on Contract DA 36-039-sc-72831. Apr 58, 7p. 3 refs. CU-37-58-ONR-266(09)-CE; CU-8-58-sc-72831-CE.
Order from LC mi$1.80, ph$1.80 PB 140 658

Coupled dilatational and equivoluminal modes of vibration are found for certain elastic prisms and polygonal plates for special values of Poisson's ratio.

Institute for Advanced Study, Princeton, N. J.
ON THE BOUND STATE PROBLEMS IN QUANTUM FIELD THEORY, by W. Zimmermann. Rept. on Contract AF 49(638)327. [1958] 26p. AFOSR TN-58-764; AD 201 863.
Order from LC mi$2.70, ph$4.80 PB 136 837

A causal and invariant scalar field involving a stable bound state is investigated. A formula for the S-matrix is derived and it is shown that the bound state can be described by a local and invariant field operator. For simplicity only the case of spin zero particles and bound states is considered; however, the extension to other cases is possible.

Maryland U., College Park.
LECTURES ON DISPERSION RELATIONS IN QUANTUM FIELD THEORY AND RELATED TOPICS, by John G. Taylor. Rept. on Contract AF 49(638)24. 1958, 3 v. 247 refs. Physics Dept. Technical rept. no. 115, vol. no. 1; AFOSR TN-58-816a; AD-202 639. Vol. nos. 1-3; AFOSR TN-58-(816a, 816b, 816c); AD-202 639, AD-202 640, AD-202 641.
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Vol. 1. Incomplete bibliography of articles on dispersion relations in field theory and related topics; and lectures I-IV, 92p. mi$5.40, ph$15.30, PB 136 847
Vol. 2. Lectures V-VIII, 92p., mi$5.40, ph$15.30, PB 136 848
Vol. 3. Lectures IX-XII, 85p. mi$4.80, ph$13.80, PB 136 849

Metcalf Research Lab., Brown U., Providence, R. I.
ON THE QUANTUM-STATISTICAL THEORY OF TRANSPORT PROCESSES. I. CORRELATION FUNCTION OF FLUXES, by Hazime Mori. Rept. on Contract AF 18(603)87. 1 Oct 57, 32p. 28 refs. AFOSR-TN-57-595; AD-136 581.
Order from LC mi$3.00, ph$6.30 PB 136 171

Contents:
Eigenfunctions and Eigenvalues of the collision operators
Generalization of Maxwell's relation
Temporal development of the Heisenberg operator
Kinetic equation for the diagonal elements

Naval Research Lab., Washington, D. C.
THE CLOCK PROBLEM (CLOCK PARADOX) IN RELATIVITY: THEORIES, BOTH PRO AND CON, RECORDED IN THE LITERATURE; AN ANNOTATED BIBLIOGRAPHY, by Mildred Benton. May 59, 54p. 241 refs. Bibliography no. 15.
Order from OTS $1.50 PB 151 671

Purdue Research Foundation, Lafayette, Ind.
THEORY OF GRAVITATION AND ITS QUANTIZATION, by Frederik J. Belinfante and James C. Swinhart. (Doctoral thesis). 30 Sep 54, 169p. 73 refs. NSF Grant G505; AD-107 012.
Order from LC mi$7.80, ph$25.80 PB 140 711

A phenomenological classical gravitational theory within the framework of special relativity is presented. The field equations are linear and derivable from a Lagrangian. The classical field is quantized in interaction with Dirac and Maxwell fields.

Thermodynamics

[Allied Research Associates, Inc., Boston, Mass.]
ABLATION OF MELTING BODIES WITH HEAT PENETRATION INTO THE SOLID, by Theodore R. Goodman. Rept. on Contract AF 49(638)347. 1 Aug 58, 19p. 4 refs. AFOSR TN-58-789; AD-202 115.
Order from LC mi$2.40, ph$3.30 PB 136 753

Two restrictive conditions which were previously imposed have been removed: viz., the heat flux is distributed according to boundary-layer theory, and heat is allowed to penetrate into the solid. The results are worked out in detail for a flat plate. In addition, a quasi-steady theory which is very simple, has been derived for an arbitrary body, and the restrictions on its validity have been estimated.

Allied Research Associates, Inc., Boston, Mass.
STAGNATION POINT MELTING AND ABLATION, by Theodore R. Goodman and Charles Chin. Rept. on Contract AF 49(638)347. 30 Mar 59, 18p. 8 refs. AFOSR-TN-59-390; AD-213 894.
Order from LC mi$2.40, ph$3.30 PB 140 523

An investigation of melting and aerodynamic ablation in the vicinity of the stagnation point of blunt bodies is presented. Numerical results for an axially symmetric aluminum body are included. The results show that the quasi-steady solution is in excellent agreement with the complete solution except at the start of the ablation process.

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TABLE OF EQUILIBRIUM COMPOSITIONS OF $(CH_2)n$+AIR MIXTURES, by R. K. Neumann. Rept. on Contract NOrd-7386. Aug 55 [99]p. 6 refs. CM-835.
Order from OTS $2.25 PB 151 296

Equilibrium compositions of the product gases for various mixtures of $(CH_2)n$+air at a number of temperatures and pressures have been computed and set up in tabular form. Included with the table are an explanation of the method of calculation and a numerical example.

Avco Research Lab., Everett, Mass.
TABLES OF RADIATION FROM HIGH TEMPERATURE AIR, by B. Kivel and K. Bailey. Rept. on Contracts AF 04(645)18 and AF 49(638)61. Dec 57, 31p. 16 refs. Research rept. 21.
Order from LC mi$3.00, ph$6.30 PB 140 398

Tables of radiative emissivity of hot air in the range of temperature from 1000°K and density from 10 to 10^{-6} of a normal atmosphere are presented. The radiative intensities are presented in graphical form.

Duke U., Durham, N. C.
ON THE STEADY-STATE THERMOELASTIC PROBLEM FOR THE HALF-SPACE AND THE THICK PLATE, by I. N. Sneddon and F. J. Lockett. Rept. on Contract AF 18(600)1341. Mar 59, 15p. 3 refs. AFOSR TN-59-301; AD-213 085.
Order from LC mi$2.40, ph$3.30 PB 140 460

This paper deals with the determination of the steady-state thermal stresses in both a semi-infinite elastic medium and a thick elastic plate. As in the analysis of Sternberg and McDowell, the problem is treated as one in the classical theory of elasticity. The method of solution employed is that of multiple Fourier transforms - in this case double transforms. A general solution, corresponding to an arbitrary temperature field, is obtained in the form of two-dimensional Fourier integrals and it is confirmed that the stress field is plane and parallel to the boundary of the medium.

Free U. of Brussels [Belgium]
STATISTICAL MECHANICS AND THERMODYNAMICS OF IRREVERSIBLE PROCESSES. VOLUME I: IRREVERSIBLE PROCESSES IN GASES, by R. Balescu and I. Prigogine. Rept. on Contract AF 61(514)957 [1959] 193p. 48 refs. Technical rept. EOARDC PR 59-18; AFOSR TR-59-44A; AD-214 526.
Order from LC mi$8.70, ph$30.30 PB 140 695

Contents:
Chap. I. Mechanical Basis of the theory
Chap. II. The distribution functions and their Fourier transforms
Chap. III. The diagram technique
Chap. IV. Evolution equations
Chap. V. Boltzman's equation and Brownian motion in weakly coupled systems
Chap. VI. The dynamical friction
Chap. VII. The double star
Chap. VIII. General conclusions

Free U. of Brussels [Belgium].
STATISTICAL MECHANICS AND THERMODYNAMICS OF IRREVERSIBLE PROGRESS. VOLUME II: IRREVERSIBLE PROCESSES IN POLYATOMIC GASES, by A. Festraets and I. Prigogine. Rept. on Contract AF 61(514)957 [1959] 48p. Technical rept. EOARDC PR 59-18; AFOSR TR-59-44B; AD-214 527.
Order from LC mi$3.30, ph$7.80 PB 140 696

Contents:
Introduction
Angle-action variables for a dipole
The master equation
Brownian motion of a dipole
Conclusion
(See also PB 140 695)

Free U. of Brussels [Belgium].
STATISTICAL MECHANICS AND THERMODYNAMICS OF IRREVERSIBLE PROCESSES. VOLUME III: QUANTUM MECHANICS OF IRREVERSIBLE PROCESSES, by I. Prigogine, M. Toda, and S. Ono. Rept. on Contract AF 61(514)957 [1959] 44p. 5 refs. EOARDC PR 59-18; AFOSR TR-59-44C; AD-214 528.
Order from LC mi$3.30, ph$7.80 PB 140 697

Contents:
Quantum gases
Introduction
Density matrix and Wigner function
Von Neuman equation in the Liouville formalism
Homogeneous systems
Non-homogeneous systems
Quantum solids
Von Neuman equation
Von Neuman equation in the Liouville formalism
Pauli equation
The problem of friction in Brownian motion
Introduction
Mechanical relations
Statistical treatment of the friction force
Langevin force
Lorentz dumping
(See also PB 140 696)

Free U. of Brussels [Belgium]
STATISTICAL MECHANICS AND THERMODYNAMICS OF IRREVERSIBLE PROCESSES. VOLUME IV: ELECTRODIFFUSION, by W. Kauman and T. Bak. Rept. on Contract AF 61(514)957 [1959] 157p. 28 refs. Technical rept. EOARDC PR 59-18; AFOSR TR-59-44D; AD-214 529.
Order from LC mi$7.50, ph$24.30 PB 140 698

Contents:
Electrodiffusion
Introduction
Electrodiffusion in a time-independent field
Electrodiffusion in a time-dependent field
Entropy production in electrodiffusion
Application to chromatography
Discussion
The electric separation of ampholytes in a medium of non-uniform pH -
Focussing of ampholytes under the influence of an electric field in a medium of non-uniform pH
Stationary state
Non-stationary state
Limitations and applications
(See also PB 140 697)

Institut de Recherches Scientifiques et Techniques du Centre-Ouest[France]
RESEARCH ON DEVELOPMENT OF A METHOD FOR MEASURING SURFACE TEMPERATURES. Technical rept. (final) on Contract AF 61(514)1193. Feb 58, 57p. IRST 55-13; AFOSR TR-58-88; AD-162 109.
Order from LC mi$3.60, ph$9.30 PB 140 449

The experimental data of this first investigation have shown that the thermal sensibility of the fluorescent emissions can be used up to 450 °C. The practical application asks now the fine investigation of all the practical powders in respect to the following points:

Influence of the excitation intensity; Influence of the powder density; Realization of paintings and of powders mixtures. In more the accurate calibration of the thermal sensibility and the systematical investigation of the fidelity of the responses with the variation of temperatures must allow to use safely this optical measurement of wall temperatures.

Institute of Engineering Research, U. of California, Berkeley.
APPARATUS FOR THE MEASUREMENT OF BAND AND TOTAL ABSORPTANCES OF GASES, by R. V. Dunkle, J. T. Gier and others. Final rept. on Contract AF 18(600)1570. 30 June 58, 63p. 26 refs. Series no. 118, issue no. 1; AFOSR TR-58-102; AD-162 225.
Order from LC mi$3.90, ph$10.80 PB 136 769

The report describes the apparatus designed and built at the University of California for the measurement of thermal radiation absorptivities and emissivities of CO, CO_2, and, with modification of the gas supply system, H_2O. The range of gas temperatures is 70 F to about 2400 F, and provision has been made for future modifications which will extend the range to 3000 F. The pressure range is 0.5 to 10 atmospheres. An optical absorption path of 15 inches is defined with an accuracy of about 1 per cent. Instrumentation is provided for the measurement of total as well as band absorptivities from 1 to 23 microns in the infrared region of the spectrum.

Quartermaster Research and [Engineering] Center, Natick, Mass.
SOLAR FURNACE DESIGN, by Donald H. Lyons, Raymond D. Cooper, and Eugene S. Cotton. 27 Jan 56, rev. 24 Apr 56. 58p. 3 refs. Special Projects Branch rept. T-7; AD-140 219.
Order from LC mi$3.60, ph$9.30 PB 140 379

The QM need for a thermal radiation source to simulate nuclear weapons is best met by a solar furnace having certain minimum requirements. Of the possible optical systems the most practical is an array of focusing mirrors with superposed images at about 35 feet, determined by the required spot area. The specified intensity requires an array area larger than 420 square feet. The single-mirror design was suggested because of the possible lower cost and the elimination of one reflecting surface. This report is aimed at a comparison of this system with the more conventional heliostat design in terms of QM needs and relative cost.

Stanford U., Calif.
AN ANALYTICAL INVESTIGATION OF THE BLOWDOWN AND CHARGING PROCESSES IN A SINGLE GAS RECEIVER, INCLUDING THE EFFECTS OF HEAT TRANSFER, by W. C. Reynolds. Technical rept. no. T-1 on Contract N6onr-251, T. O. 6. 1 Oct 55, 113p. 11 refs. AD-75 074.
Order from LC mi$6.00, ph$18.30 PB 140 779

This report presents a variety of analyses of the blowdown and charging processes in a single gas receiver, including the effects of heat transfer. General differential equations governing these processes are developed in detail, and series from solutions of these equations are obtained for the case of constant mass flow. Several closed form solutions for limiting values of the heat transfer parameters are presented and shown to be of interest. Substantially good agreement of available data with the solutions is demonstrated.

University of Southern California. Engineering Center, Los Angeles.
THERMAL CONDUCTIVITY OF SOLID NITROGEN AND THE DIRECT CONDENSATION OF NITROGEN GAS INTO A SOLID, by Krishnamurty Karamcheti. Technical note on Contract AF 18(603)95. 31 Jan 59, 16p. 4 refs. USCEC rept. 56-206; AFOSR TN-59-183; AD-211 323.
Order from LC mi$2.40, ph$3.30 PB 140 225

In the U. S. C. low density tunnel designed to operate on the "two-phase" principle, nitrogen gas is used as the working medium. Downstream of the test section, the gas is condensed directly into a solid by exposing the gas to a refrigerated surface maintained at a constant temperature (in the range of 15 to 30° K). To estimate the condensation rate (i. e., the mass of nitrogen condensed per unit time) per unit area of the surface the problem is treated from the point of view of one-dimensional unsteady heat conduction through the growing layer of the solid condensate. An analytical solution of the problem is obtained.

Wave Propagation

Institute of Research, Lehigh U., Bethlehem, Pa.
SHOCK FORMATION FROM STRONG COMPRESSION WAVES, by Reynold A. Shunk. Technical rept. 11, 1951 - 1956, on Contract N7onr-39302. 1 July 58, 63p. 10 refs.
Order from LC mi$3.90, ph$10.80 PB 140 528

Strong compression waves in a gas are produced in a tube by accelerating a light piston. The shock which forms and grows out of the compression wave and the changing form of the compression wave are observed by optical methods. Approximate methods of calculating the shock formation and growth (Friedrichs, Pillow, Lighthill) are inadequate for compression waves of density ratio 2 or more in sulfur hexafluoride gas. A wave diagram method is presented which correctly predicts the essential features.

Institute of Mathematical Sciences, New York U., N. Y.
DIFFRACTION OF A PLANE WAVE BY A RIGHT ANGLED WEDGE WHICH SUSTAINS SURFACE WAVES ON ONE FACE, by Frank C. Karal, Jr. and Samuel N. Karp. Rept. on Contract AF 19(604)1717. Jan 59, 29p. 20 refs. Research rept. no. EM-123; AFCRC-TN-59-100; AD-208 046.
Order from LC mi$2.70, ph$4.80 PB 140 401

We consider the diffraction of an electromagnetic plane wave incident on a right angled wedge with an impedance type boundary condition prescribed on one surface and a homogeneous boundary condition prescribed on

the other. The impedance boundary condition is such that surface waves are generated. We present an exact mathematical solution and find the amplitude of the surface wave. A simple asymptotic representation for the far field is also given.

Electrical Engineering Research Lab., U. of Texas, Austin.
2.15 MILLIMETER RADIO FREQUENCY PROPAGATION STUDIES OVER A 1.5 Km PATH, by C. W. Tolbert, C. O. Britt, and A. W. Straiton. Rept. on Contract Nonr-375(01). 15 July 58, 22p. 11 refs. Rept. no. 101.
Order from LC mi$2.70, ph$4.80 PB 140 466

The measured propagation characteristics of 2.15 millimeter radio waves over three different paths are presented in this report. The paths were near the ground, one of which was 1.5 kilometers in length over grass and cultivated fields, one 1.5 kilometers in length over a roadway, and one was 0.63 kilometer in length over grass. The measured value of absorption due to water vapor was found to be 0.25 decibel per kilometer of path length per gram of water vapor per cubic meter. This is approximately ten times as great a loss as calculated by T. F. Rogers on the basis of the Van Vleck-Weisskopf equations.

Electrical Engineering Research Lab., U. of Texas, Austin.
BACK SCATTERING CROSS-SECTIONS AT 4.3 MILLIMETER WAVELENGTHS OF MODERATE SEA SURFACES, by C. W. Tolbert, C. O. Britt, and A. W. Straiton. Rept. on Contract Nonr-375(01). 8 Nov 57, 17p. 4 refs. Rept. no. 95.
Order from LC mi$2.40, ph$3.30 PB 136 746

The back scattering cross-section of a moderate sea was measured at 4.3 millimeter wavelengths. These measurements were made normal to the wave motion, at 45° to the wave motion, and parallel to the wave motion. All the measurements were made at small grazing angles. The back scattering cross-section measured at these wavelengths is larger than values reported for the longer wavelengths.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SEQUENTIAL DESIGN OF EXPERIMENTS, by Herman Chernoff. Technical rept. no. 42 on Contract N6onr-251(40). 24 June 58, 33p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 140 345

In this paper we present a procedure, and some modifications of it, for the sequential design of experiments where the problem is one of testing a hypothesis. Formally, we assume that there are two possible actions (terminal decisions) and a class of available experiments. After each observation, the statistician decides on whether to continue experimentation or not. If he decides to continue, he must select one of the available experiments. If he decides to stop he must select one of the two terminal actions.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
DESIGN CRITERIA FOR A SENSITIVE INFRARED-ABSORPTION HYGROMETER, by R. A. Hanel. 8 Sep 58, 22p. 9 refs. USASRDL Technical rept. 1988.
Order from LC mi$2.70, ph$4.80 PB 140 669

This report presents design criteria for a device to measure atmospheric water-vapor content by using absorption techniques in the infrared region. In discussing the absorption theory and basic relationship, the report shows that the well-known square root relationship is valid for some of the absorption range only; below a certain level the response is linear. It is pointed out that the absorption function in the linear range should be independent of pressure. The report also describes a laboratory model of the hygrometer. Although this device is still in the experimental stage, the ultimate objective is to make the design sensitive and accurate enough for use at the low temperatures and low pressures encountered by aircraft.

Minnesota U., Minneapolis.
A TABLE OF DISTANCES FOR THE SEMANTIC ATLAS, by James J. Jenkins, Wallace A. Russell, and George J. Suci. Technical rept. no. 20 on The Role of Language in Behavior, Contract N8onr-66216. July 58, 5p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 140 481

The present report is intended to facilitate the investigation of hypotheses concerning the nature of the "semantic space." Because of the high cost of reproducing this material and the size of the table, only a limited number of copies have been prepared. Investigators who are interested in using these data for research purposes may borrow copies of the table from the University of Minnesota Library through the Inter-Library Loan Service.

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS. Quarterly rept. for Oct-Dec 58. 30 Apr 59, 91p. 28 refs.
NOLC rept. 443; NAVORD rept. 5945.
Order from LC mi$5.40, ph$15.30 PB 140 352

Contents:
Automatic programming, by R. de la Briandais
Communication stochastics, by R. L. Conger and L. T. Long
Ferroelectric phenomena, by D. J. White and H. H. Wieder
Ferromagnetic resonance, by R. L. Conger and R. W. Sharp
High-temperature polymer program, by B. Bartocha, A. Bilbo, and D. Herring
Infrared atomic spectra, C. J. Humphreys and E. Paul, Jr.
Organoaluminum and aluminum hydride chemistry, by B. Bartocha and M. Y. Gray
(Research Methods, Techniques and Equipment, 14 Aug 59) (over)

Radiation analysis, by H. W. Neill
Semiconductor physics, by J. Yahia

Stanford U., Calif.
BALANCED GROWTH AND EFFICIENCY IN A LINEAR MODEL OF PRODUCTION, by Hirofumi Uzawa. Technical rept. no. 5 on Contract Nonr-225(28). 10 July 58, 11p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 140 465

John von Neumann constructed a linear model of an expanding economy and proved the existence of a balanced growth. David Gale recently constructed a more general linear model and the expansion theorems were investigated in greater detail. In the present note we shall give a simple proof of the von Neumann theorem in the Gale model of production and show that an efficient production is completely characterized by profit maximization with given shadow prices.

Communication Theory

Hebrew U. (Israel)
REPORT ON THE STATE OF MACHINE TRANSLATION IN THE UNITED STATES AND GREAT BRITAIN, by Yehoshua Bar Hillel. Technical rept. no. 1 on Contract Nonr-2578(00). 15 Feb 59, 81p.
Order from OTS $2.25 PB 151 746

The present report contains a critical survey of the status of research on the mechanization of translation in the United States and Great Britain, especially of the methodological and linguistic aspects of this problem. The unreasonableness of aiming at fully-automatic high-quality translation is stressed, the shortcomings of the approaches sticking to this aim discussed, and its lowering to that of either providing machine aids to high quality translation or providing fully-automatic but low-quality translation advocated. Some proposals for the organization of further research and for the improvement of cooperation are made.
Appendices:
MT statistics as of January 1, 1959
Some linguistic obstacles to machine translation
Decision procedures for structure in natural languages
A demonstration of the non-feasibility of fully-automatic high-quality machine translation

Zator Co., Cambridge, Mass.
A NEW METHOD FOR DISCOVERING THE GRAMMARS OF PHRASE STRUCTURE LANGUAGES, by R. J. Solomonoff. Rept. on Contract AF 49(638)376. Apr 59, 15p. 4 refs. ZTB-124; AFOSR TN-59-110; AD-210 390.
Order from LC mi$2.40, ph$3.30 PB 140 705

A new method has been devised for the discovery of the grammars of phrase structure languages. The method has applications in information retrieval, linguistics, pattern discovery and a kind of mechanical translation. A technique is used that is similar to one described by Chomsky and Miller for discovering the grammars of finite state languages. In finite state languages, a phrase that forms a "cycle" may be successively repeated an arbitrary number of times in an acceptable sentence, because the insertion of that phrase does not change the state that exists at the point of insertion. The set of all such cycles and higher order cycles that exist in a phrase structure language along with the insertion rules, constitute a complete grammatical description of the language. These cycles are discovered by a systematic process of deletion and reinsertion of phrases and pairs of phrases. A "teacher" or equivalent, is used to determine if the sentences resulting from the deletions and reinsertions are acceptable sentences.

Information Theory

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON THE CODING THEOREM AND ITS CONVERSE FOR FINITE-MEMORY CHANNELS, by A. Feinstein. Technical rept. no. 41 on Contract N6onr-251(40). 20 June 58, 27p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 140 346

A new definition for the capacity C of a (discrete or semicontinuous) channel with finite memory is given. In terms of this definition both the coding theorem and its weak converse are easily established. In particular, all questions of the ergodicity of the channel-source distribution are avoided, and we are able to show for discrete channels that both the ergodic and stationary capacities (as given by the Shannon-McMillan definition) coincide with that given here. Finally, the strong converse of the coding theorem is shown to hold for a particular finite-memory channel recently considered by Wolfowitz.

Ballistic Research Lab., Aberdeen Proving Ground, Md.
PRINCIPLES OF INFORMATION ENGINEERING, by K. A. Pullen, Jr. Feb 59, 9p. 2 refs. Memo. rept. no. 1193.
Order from LC mi$1.80, ph$1.80 PB 140 772

The problem of efficient utilization of information is one of growing importance, both in system design and system utilization. The relation of information utilization to information theory and the practical use of communication systems is examined in this report, and some of the guiding principles of information engineering explained.

Center for Documentation and Communication Research, Western Reserve U., Cleveland, Ohio.
THE STORAGE AND RETRIEVAL OF NONNUMERICAL DATA IN LARGE AND COMPLEX DOCUMENTATION SYSTEMS, by Allen Kent and J. W. Perry. Technical note no. 6 on Contract AF 49(638)357. 24 Feb 59, 27p. 8 refs. AFOSR TN-59-82; AD-210 142.
Order from OTS $0.75 PB 151 639

The introduction of automatic routines for the precise selection of pertinent information from large document collections covering broad areas of subject matter requires a careful analysis of the input and output phases of the documentation system used. A simplified model has been hypothesized to provide a universe of information with which to study various information retrieval systems, and to provide a basis for characterizing and later identifying information which involves no uncertainty. Some of the problems involved when uncertainty is introduced are discussed in qualitative terms.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
INFORMATION THEORY IN AIR TRAFFIC CONTROL, by Edward Fritz. [1956] 6p. AD-111 118.
Order from LC mi$ 1.80, ph$1.80 PB 136 092

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
BASIC CONCEPTS OF INFORMATION RETRIEVAL, PART I, by William J. Turanski. Technical rept. no. 17 on Contract Nonr-2297(00). 25 Nov 57, 11p.
Order from LC mi$2.40, ph$3.30 PB 136 841

This paper is the first in a series aimed at providing a broad theoretical foundation for the problem of information retrieval. Although much work has been done in the field, there has been lacking a standardized point of view from which to evaluate different systems or to design new systems satisfying given requirements.

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
INFORMATION RETRIEVAL BY UNIVAC AND BY UNIVAC-PRODUCED NON-MECHANIZED SYSTEM, PART I, by John J. O'Connor. Technical rept. no. 18 on Contract Nonr-2297(00). 25 Nov 57, 98p. 13 refs.
Order from LC mi$5.40, ph$15.30 PB 136 842

So much technical literature exists today and so much scientific research now cuts across traditional subject matter boundaries that traditional methods of literature search have become inefficient and unreliable. The fast and reliable recovery of relevant information from large files has also become more of a problem for businessmen and lawyers. It has been established during the last ten years that much if not all recovery of relevant information from large files can be mechanized and thereby often made efficient and complete. Parts II and III of the present report describe two alternative ways of using a UNIVAC for information retrieval. The formulas for the number of storage tapes needed and for the search times are given. Part IV describes a non-mechanized retrieval system which can be produced by a card punch and a printer operated by UNIVAC-produced tapes. Once a system is thus produced, its punched cards and printed tables are used without any machines. The formulas for storage and search time are indicated.

SOCIAL SCIENCES

Documentation

Battelle Memorial Inst., Columbus, Ohio.
TECHNICAL INFORMATION UTILIZATION BY DEVELOPMENT AND PROOF SERVICES, APG, by J. W. Perry, M. M. Berry and others. Final rept. on Contract DA 33-019-ORD-1368. Jan 54, 103p.
AD-125 114.
Order from OTS $2.50 PB 151 287

Development and Proof Services (D and PS) spend annually $20,000,000 in conducting experiments and tests relating to problems in ordnance design and performance. Synthetic rubber for tank treads, new alloys and welding methods for armor, and propellant formulation for recoilless guns illustrate the range of problems involved. The D and PS engineers, confronted with heavy test schedules, have felt compelled to rely on experience or memory - either directly or indirectly - when planning and conducting test programs. The present survey revealed that there is low probability that a report will be consulted unless an engineer remembers that it exists and contains pertinent information. In arriving at recommendations for remedial measures, the possibility of applying indexing and classifying techniques not now used by TIB was considered. Careful attention was directed to various recently developed mechanical aids such as punched cards, both hand-sorted and machine-sorted, other equipment such as the Rapid Selector and related methods such as coordinate indexing and the Uniterm system. The following remedial measures are recommended: (1) Establish, as a well-defined responsibility, the task of correlating available information with incoming directives to ensure that new experimental work is directed to producing needed data not otherwise available. (2) Facilitate utilization of information stored in TIB by the following six-point program: (a) Initiate development of an abstracting-indexing system to meet present needs and provide for future contingencies. (b) Prepare a monthly abstract bulletin to provide a continuing resume of D and PS activities. (c) Maintain an abstract file to facilitate the preparation of comprehensive summary reports and the correlation of data. (d) Maintain, near the offices of test engineers, special limited collections of reports, textbooks, test manuals, and the like pertaining to the engineers' field of specialization. (e) Microfilm the acceptance-test records and thus conserve considerable space within TIB. (f) Continue present methods for indexing and filing of photographs and blueprints.

California U., Los Angeles.
UCLA EXECUTIVE GAME NO. 1: COMPUTATIONAL MODEL, by James R. Jackson. Rept. on Management Sciences Research Project [Contract Nonr-233(02)]. 13 Feb 58, 7p. Discussion paper no. 64.
Order from LC mi$1.80, ph$1.80 PB 140 527

Industrial Coll. of the Armed Forces, Washington, D. C.
THE PROBLEM OF MAINTAINING GOVERNMENTAL AUTHORITY UNDER CONDITIONS OF NUCLEAR ATTACK, by Charles Fairman (Harvard Law School). 12 Apr 57, 25p. 20 refs. Pub. no. L57-146; AD-140 344.
Order from LC mi$2.70, ph$4.80 PB 136 686

The relation of civilian to military authority is discussed in terms of effective government in the event of a nuclear attack. The national policy is presented as maintaining effective civil government throughout the country, endeavoring to strengthen the institutions of civil government against the nuclear danger, and if they are overborne by an attack, restoring them as rapidly as possible. Martial law and its use is discussed.

Quartermaster Research and Engineering Center, Natick, Mass.
BODY BUILD IN A SAMPLE OF THE UNITED STATES ARMY. PART I. BODY BUILD IN RELATION TO MILITARY FUNCTION. PART II. MEASUREMENTS OF BODY BUILD, by Earnest A. Hooton (Harvard U.) Rept. on Contracts W44-109-QM-(1078, 2014). Feb 59, 368p. Technical rept. EP-102.
Order from LC mi$11.10, ph$56.10 PB 140 689

Part I covers: (1) the general distribution of body types classified into 18 groups, as determined from the assessments of individuals by morphological studies of photographs and the use of the stature divided by the cube root of weight index; (2) the military utility of each of the several groups, whether for combat or service, as indicated by the extent to which various body types tended to be concentrated in distinct Army units and specialties; (3) the correlations of the body build groups with all sociological and other data compiled in the survey, such as age, months of service, birthplace, etc. Part II deals with the more important measurements gathered on individual soldiers during the course of the survey, as such measurements apply to various body types, previously determined from the photographs.

Stanford U., Calif.
RATIONAL CHOICE FUNCTIONS AND ORDERINGS, by Kenneth J. Arrow. Technical rept. no. 58 on Contract N6onr-25133. 25 July 58, 14p. 17 refs.
Order from LC mi$2.40, ph$3.30 PB 140 200

It is the suggestion of this paper that the demand-function point of view would be greatly simplified if the range over which the choice functions are considered to be determined is broadened to include all finite sets. Indeed, as Georgescu-Roegen has remarked, the intuitive justification of such assumptions as the Weak Axiom of Revealed Preference has no relation to the special form of the budget constraint sets but is based rather on implicit consideration of two-element sets.

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. July 59.
Order from OTS $1.25, $10.00/year PB 151 340

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Resonant scattering of X-rays, by R. A. Tobin and L. Cohen
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General

Annual progress report covering researches during the period June 1, 1957 to May 31, 1958. Report no. 53. Massachusetts Inst. of Tech. Lab. for Nuclear Science, Cambridge, Mass. 1958. Contracts Nonr-1841(16); AT(30-1)-2098; AF49(638)-181 and AT(30-1)-905. 206p. Order from LC. Mi $9.30, ph $31.80. AECU-3908

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Controlled Thermonuclear Processes

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A study of decontamination agents for use in the Yankee reactor, by R. M. Watkins. For Yankee Atomic Electric Co. Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh, Pa. Nov 1958. Contract AT(30-3)-222, subcontract no. 1. 44p. Order from LC. Mi $3.30, ph $7.80. YAEC-90

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Stable Isotope Separation

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Laboratory and pilot plant evaluation of Milliken uranium concentrate, by Nelson R. Leist and

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Technology—Raw Materials

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Topical report. Physical beneficiation of low-grade uranium ores, by John N. Butler. Univ. of Nevada. Mackay School of Mines, Reno, Nevada. Jul 1958. Contract AT(49-1)-624. 139p. Order from OTS. $2.75. RMO-2683

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